TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XI AUGUST 14, 1922 NUMBER 4

FEATURES OF THIS ISSUE

"Shampooing Rugs," by Charles F. Goldthwait, discusses the advantages and disadvantages of this method as opposed to dry cleaning.

Part III of "A Consideration of the Various Substances Used in the Construction of Dyeing and Bleaching Utensils and Apparatus," by Grandage and Hadley, treats further of Monel metal and Plum-bized apparatus.

"Things Every Textile Chemist and Colorist Should Know" takes up mercerization and the action of chlorinated alkalis on cotton.

Raffaele Sansone contributes Part II of his "Notes on the Dyeing of Direct Blacks on Cotton Piece Goods," with diagrams of plants.

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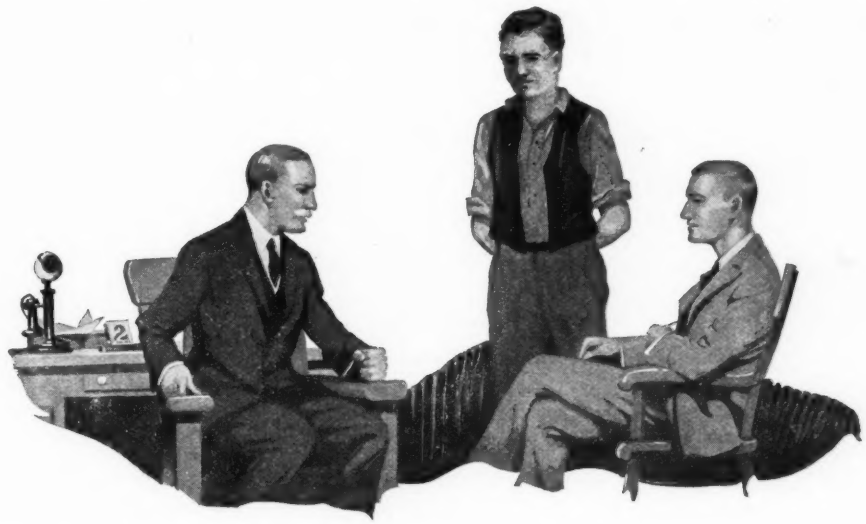

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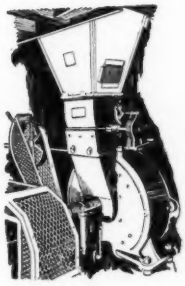

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"National" News

OF INTEREST TO DYERS AND THE COLOR USING INDUSTRIES IN GENERAL

Prepared by the

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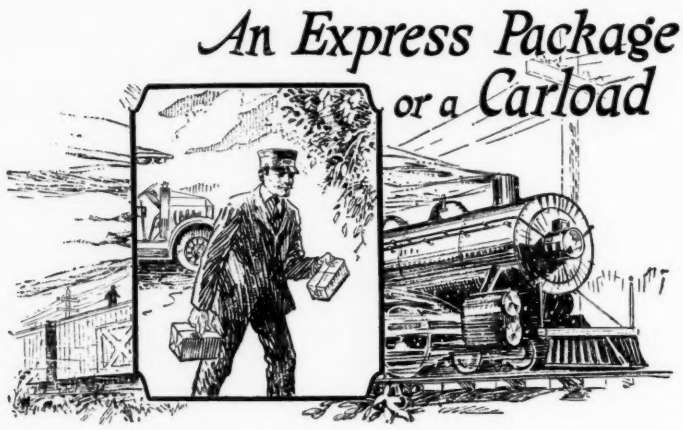

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The three chrome processes, orthochrome, after-chrome and chrome bottom methods are separately treated in the text.

Probably the most important feature in this card is the separate listing of those "National" Chrome colors particularly suitable for machine dyeing, for best fastness to milling and to carbonizing, for production of combination shades, for leaving cotton effects and silk effects unstained, for dyeing in copper and in iron machines and for subsequent shading of dyeings.

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VOLUME XI | NEW YORK, AUGUST 14, 1922 | NUMBER 4

Shampooing Rugs

Cleaning of Rugs and Carpets—Dusting Appliances—Scouring—The "Shampoo"—Scouring vs. Dry Cleaning—Initial Investment an Item—Advantages and Disadvantages—New Fastness Requirement Indicated

By CHARLES F. GOLDTHWAIT

Chemist, Klearflax Linen Rug Company, Duluth, Minn.

THE cleaning of rugs and carpets should interest each of us that owns one, and especially the chemists and colorists concerned in their manufacture.

Not so many years ago the standard practice was whipping on the clothes line with a (usually abbreviated) horsewhip, or a switch from some convenient bush, or perhaps belaboring with a wire paddle, operations that do not appeal to a chemist—or to anyone else.

Whether the transition has come about through the growing scarcity of horses or the scientific tendency of the times can be settled by the historians. At any rate, there have been rapid developments, especially during the last decade, and along with many other household tasks, rug cleaning has been taken over by the professional.

Dusting a Necessary Preliminary

Dusting in some form is and always will be an essential step in carpet cleaning. It is accomplished in the "wheel" or by a special beater.

The first illustration shows a popular type of dust wheel (*Fig* 1, courtesy of Chief Manufacturing Company, Indianapolis).

It is intended to carry the rugs up and then drop them, over and over again, but is designed so that the rugs will not get sufficient drop to damage them, although the sizing on the back may be more or less broken. No rugs should be run too long, as it is rather rough treatment at best, and may tend to make them limp.

Other Dusting Appliances

Another type of beater consists essentially of a revolving shaft carrying a number of straps which whip the rug as it is passing through, an automatic reminder of early days. Our second illustration shows one of these machines. The largest will take rugs up to sixteen feet in width and will beat them 100,000 times for every eight feet in length that passes through while suction arrangements take away the dust.

Other dusting appliances are the vacuum tool and compressed air, the latter being perhaps the most thorough of all, but at the same time the most disagreeable to use.

Scouring

It is now realized that any dusting method is insufficient as the sole means of cleaning, and, in fact, some scouring has long been practised. It was done rapidly by hand with a good lather and comparatively little wetting of the rug. Some cleaners still adhere to it and can go over a large rug with remarkably quick and level results.

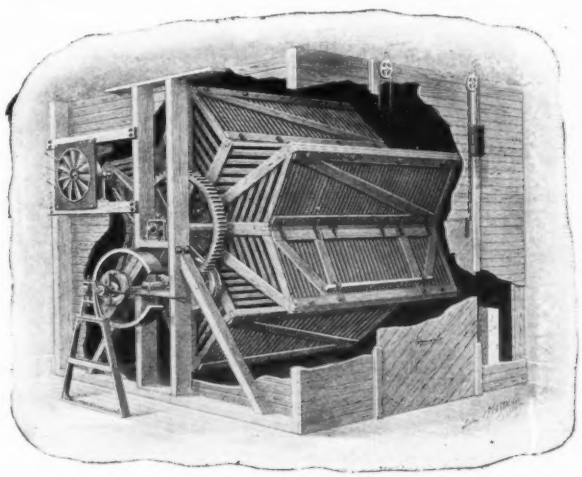

Fig. 1—*Dust Wheel*

The "Shampoo"

With most cleaners, however, and especially in the larger establishments, the hand method has gone the way of many similar operations and has been replaced by modern and efficient machinery. The process is referred to as the "shampoo" for reasons that will soon be obvious. Since this method of cleaning is now the most used of any and is a matter of direct interest to the carpet colorist we will investigate it in some detail.

over a whole rug, the result may be anything but satisfactory. Such experiences have been made to reflect on some kinds of carpeting, especially one-tone rugs, where the fault was really with the cleaning rather than with the rug itself. For the same reason some cleaners do not care to take one tone work. When it is considered, however, that the standard time for shampooing a 9x12 rug is three minutes it is evident enough that the brush cannot act very long on any one spot and the scouring is not as severe as one would think.

FIG. 2—*"Strap and Suction" Beater*

Rug scouring has, of course, originated from the fact that mere dusting will not remove all the dirt, as there are various forms of "matter misplaced" that adhere firmly to the surface fibers. Scouring should be preceded by a thorough dusting, and, stripped of detail, consists of brushing the surface thoroughly with soap suds by means of a rotary floor scrubbing machine, scraping off the excess soap and removing as much as possible of the cleaning solution with a vacuum, then rinsing and removing the rinse water in the same way. The rinse is often followed by a second rinse or a sour with acetic acid. The rug is then dried by merely hanging in some convenient room or by artificial heat in a dryer at moderate temperature.

The shampoo is shown in *Fig.* 3 (Electric Rotary Machine Company, Chicago), where one operator is applying the lather and another removing the residual soap liquor by suction.

Such scrubbing is a severe treatment and cleaners will be found recommending everything from caustic to pure cocoanut oil soap. Most of us would not care to trust our rugs to any such cleaning process where free alkali is used, and it is rather fortunate that the majority of cleaners seem to prefer a certain popular brand of soap, the one that gets the most free advertising.

Effects of Treatment

The average scrubbing brush is about 14 inches in diameter and the whole machine weighs close to 70 pounds. It is obvious that such a weight acting for a long time on a revolving brush on a small area of delicately colored carpet can easily do considerable damage, and if the scrubbing treatment is irregularly performed

Rinsing

Rinsing should be as thorough as reasonably possible, for soap left in a cleaned rug will give it a sticky "feel" and cause it to easily attract dirt again. Since it is so difficult to wash out soap, especially with the cold water it is necessary to use, the acetic acid is applied partly to "neutralize" what is left. It also has a tendency to brighten the colors.

That the shampoo process is effective has been demonstrated many times by our own cleaning of rugs that have been submitted to the "sidewalk" test. Even those that have been out on a walk for a month or two respond to thorough dusting and two shampoo treatments.

Judgment Required

It may be well to mention here that rug cleaning does not want too much standardizing, for rugs have individuality. No two coming into the same plant are just alike or are soiled in just the same way, so it cannot be expected to give them all exactly the same treatment and get the most satisfactory results in every case. For this reason large machines which perform the entire work automatically are not as desirable as a certain amount of hand labor.

Dry Cleaning

The final method of cleaning rugs is the ordinary dry cleaning, and there is frequently an argument between the advocates of this process and those who prefer shampooing. While this is often merely a tilt between the owners of one kind of machinery and those of the other,

there are certain differences between the results obtained and certain advantages with either type. It is good theory, in cleaning any kind of fabric afflicted with an accumulation of miscellaneous dirt, first to remove the oily and greasy matter by extracting with the common cleaning solvents, gasoline or benzol, but this is not always sufficient to remove the insoluble embedded matter. However, once the grease, which acts as a binder or protective agent, is removed, the remaining dirt is rendered carpet yarn, it would have the same effect in keeping the fibers soft and pliable.

The writer knows from experience that more than a little grease is frequently left in rugs from the careless use of dirty gasoline, and is inclined to consider the removal of oil as one of the imaginary objections to dry cleaning. It would, however, be possible to regulate this factor, as in the scouring of wool, and leave just the right amount of some suitable wool oil in the carpet.

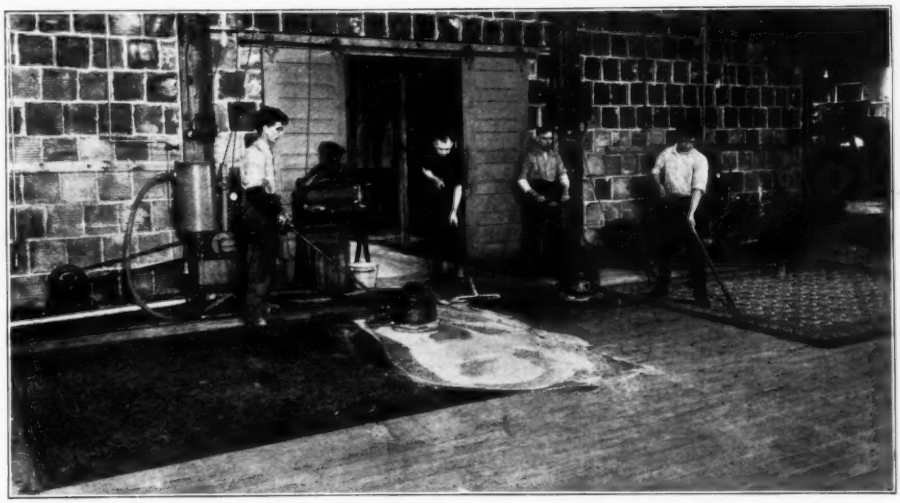

FIG. 3—*Shampoo and Vacuum Machines in Operation*

much more susceptible to soap and water. The ideal process would be a dry cleaning followed by a light shampooing, but is too expensive except for very high-class work.

EFFECTS OF DRY CLEANING

The dry or naphtha cleaning is carried out in just the same way as the cleaning of garments, by running in a metal washer with gasoline, then extracting and drying. Giant machines are built especially for the purpose, operating on the same general principlss as laundry washers. *Fig.* 4 shows one made by the American Laundry Machinery Company, Cincinnati. Such machines are made fourteen feet long and weighing four tons, with a capacity for several large rugs.

One of the arguments against dry cleaning is that it gradually extracts all the oil from the wool fiber to its ultimate injury. This, of course, is somewhat hard to establish without extensive experiments, as any rug in use is slowly deteriorating and it would be almost impossible to state in a specific case just what was the influence of the cleaning.

It is also a fact that since gasoline is used over and over again—since it is intended as a solvent for all kinds of oil and grease and since it is not always purified between times with the greatest of care—there is likely to be a little oil left behind in the rug each time. Although not exactly the same as the traces of grease in the original

Rugs made from linen or cotton are free from these complications.

FIELD FOR EDUCATIONAL WORK

It was somewhat astonishing to find recently that one of the manufacturers of rug cleaning machinery had written a number of manufacturers of rugs to get their ideas on cleaning and found that none of them knew anything about the subject or showed any apparent interest in it.

We should give, however, some attention to cleaning

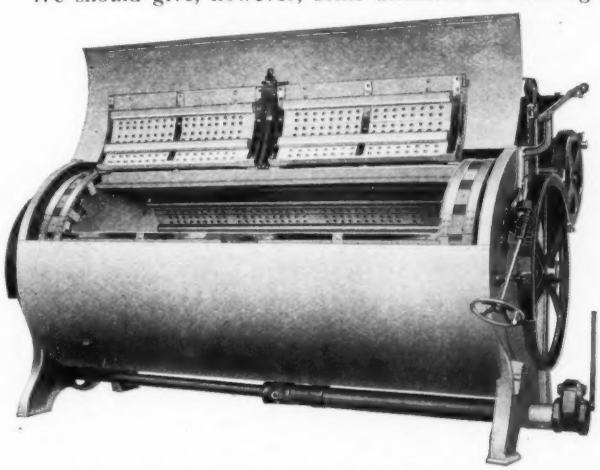

FIG. 4—*Washer for Dry Cleaning of Rugs*

rugs because dry cleaning equipments large enough to handle room-size rugs are very expensive. So much so that we cannot expect this method, which we would prefer since it is not severe on our dyes, to be very widely used. The shampoo or soap scouring process requires a much less expensive plant, and is convenient and easy to operate, especially for the smaller cleaner.

The growing tendency to use this comparatively recent and rapidly developing process seems to impose a new fastness requirement.

A Consideration of the Various Substances Used in the Construction of Dyeing and Bleaching Utensils and Apparatus

Part III

Additional Applications of Monel Metal—Proper Care of This Alloy Should Be Understood—"Order Heaven's First Law" in the Dyehouse—Non-corrosiveness of Monel Metal Widens Field of Usefulness—Strength and Durability—Plum-bized Apparatus

By H. GRANDAGE and W. E. HADLEY

IN addition to the uses to which Monel metal may be put, as outlined in a previous article of this series, there are many other applications which may be made of Monel metal in every up-to-date dyehouse and bleachery. Furthermore, Monel metal is admirably adapted for the manufacture of various types of machinery, and many different uses are constantly being discovered wherein the use of this metal is giving far greater satisfaction than the materials formerly use.

Care of Utensils Should Be Understood

The application of Monel metal to dyehouse utensils, such as pails, dippers, scoops, strainers, sieves, etc., is worthy of an active campaign on the part of those in charge of the dyehouse, in order that the workmen may become familiar with the many advantages accruing from the use of such utensils, and that due care may be exercised in the employment of this better type of apparatus, the use of which by the workmen should add to the general satisfaction of all concerned.

It would certainly not be good judgment on the part of the mill management to purchase the more expensive Monel metal equipment with the idea that it will outwear all other types of apparatus without due care and attention being given to its use, but it is true, without question, that with proper care and attention Monel metal apparatus will give excellent satisfaction where other substances have proved to be of uncertain value. Inasmuch as the best available apparatus is being obtained, it should logically follow that the best care and attention should be given to its use. Under such conditions Monel metal will be found to meet expectations in the great majority of cases.

"A Place for Everything—"

In many dyehouses it is no uncommon sight for apparatus, particularly the smaller pieces, to always be lying around wherever they happen to be; but a well-regulated dyehouse has places provided for these different utensils, and the slightly added care necessary under such conditions certainly adds to the life of the apparatus and is well worth the additional attention required.

The life of the utensils will also be enhanced if a pail is used where a pail is required, and not a dipper. In other words, if the apparatus is used for the purpose for which it is designed it will certainly have a longer life and yield far greater satisfaction.

It seems hardly necessary to mention that dippers should not be used as hammers, and yet many helpers in the dyehouse, when carrying dry dyestuffs in Monel metal dippers, or any dippers in fact, oftentimes remove the last traces of dyestuff or chemical by hitting the dipper upon the edge of the vat or pail, which certainly cannot be expected to do anything but cause injury to each piece of apparatus. The dippers should always be carefully rinsed with clean water and then placed so as to properly drain and dry.

Applications of Monel Metal Extended by Virtue of Non-corrosive Action

The non-corrosive action of Monel metal renders it extremely useful under many conditions; and even though the first cost of installation may be somewhat in excess of what some other metals might amount to, the added life of Monel metal under adverse circumstances is ample justification for the installation of Monel metal. Only recently one of the largest and

most up-to-date hospitals being built in New York City has had all table tops which will be in contact with corrosive solutions covered with Monel metal.

Monel metal is extremely well adapted for use in the construction of ventilation flues over dye kettles and dye vats, which in many dyehouses are a constant source of annoyance and expense due to the fact that they have been constructed of wood, galvanized iron, etc., and the drippings from same are very liable to injure the goods being dyed.

Leaders and gutters which must of necessity at times come within the buildings could well be made of Monel metal, under which condition the constant repairs and expense entailed by the use of other types of material would be wholly done away with.

Strength Permits Lightness

Monel metal possesses great strength, and for this reason it is often possible to use it in much thinner forms than would be possible with other metals. The only precaution necessary in such a case would be to have the thinner layers of Monel metal properly supported. In this manner the cost of installing Monel metal apparatus could be greatly reduced. The proper advice and counsel as to the construction of Monel metal apparatus can be readily obtained from any one of the many concerns now handling this metal.

Monel metal is particularly useful in the construction of machinery parts to be used in marine work, owing to its non-corrosiveness. It finds wide application for such parts as propellers, pump linings, and pump and piston rods.

Monel metal is giving very great satisfaction for the manufacture of cornices, gutters, ventilators, skylights, metal window frames, mine screens and chutes, and smelter roofs. It is also well adapted for and produces beautiful trimmings for hardware such as doorknobs, hinges, etc., where its high luster and non-oxidizing qualities are very desirable.

It is the opinion of the writers that the field of usefulness of Monel metal in the textile industry has not been covered by any manner of means in this article, and that many new uses and adaptations will be found for this alloy.

Plum-bized Apparatus

In many dyehouses, particularly those where wool material is being colored with acid dyes, Plum-bized apparatus is used for handling solutions of sulphuric acid. Plum-bized pails have become almost a necessary adjunct of the wool dye house. They are made of a comparatively thin steel, which gives them strength without undue weight, and this is thoroughly coated with lead by a special process, which renders the apparatus almost as resistant to sulphuric acid as if it was constructed of lead alone.

The use of a similar pail constructed entirely of lead would be prohibitive on account of its excessive weight; but inasmuch as a standard 2½-gallon pail constructed of this material has an additional weight of only 4 pounds, which is equivalent to only 2 quarts of water, this additional weight is negligible.

The cost of these pails is comparatively low, particularly when their durability is considered.

Things Every Textile Chemist and Colorist Should Know

[*Note—Under this heading is introduced as a more or less regular feature the discussion of certain fundamentals which should be a part of every textile chemist's and colorist's working knowledge. It is hoped that such discussions will instruct some of the younger readers, and serve as a review for those of broader experience and knowledge.*]

No 7

Mercerization and the Action of Chlorinated Alkalis on Cotton

Mercerization

THE action of strong caustic soda or caustic potash solution on cotton is extremely characteristic and the practical application of such a treatment has proved of great interest and value to the textile industry.

If a piece of cotton cloth is steeped for a few minutes in a solution of caustic soda of a concentration of 50 to 60 deg. Tw. (Sp. Gr. 1.25 to 1.30), it assumes a gelatinous appearance, and when taken out and washed is found to have shrunk considerably in surface area and to have become of much closer texture.

A single fiber of this cloth examined under the microscope is found to have lost the appearance of a perfectly normal cotton fiber. The spirally twisted appearance has disappeared as well as its superficial markings, and it has become thick, straight, rod-shaped and transparent. The sectional appearance is entirely changed also. It has no longer the appearance of a flattened tube, but is cylindrical, while its walls have thickened until the central opening has become a mere point.

Cotton treated in this way not only increased in strength but possessed a greater attraction for coloring matters than the untreated cotton.

This peculiar action of caustic soda was discovered by John Mercer, a Lancashire calico printer, in 1844 while attempting to filter a concentrated caustic soda solution through a piece of cotton cloth. Later he patented a process for treating cotton cloth with caustic soda, and hence the term mercerization.

Mercer's process consisted in simply passing the cloth through a caustic soda solution, when the action already mentioned took place. The results were that cloth counting 100 threads to the inch would become so compact as to count 135. The increase in strength for a given width was 50 per cent, or even more, and a given amount of cloth, by measure, would increase 4.5 to 5.5 per cent in weight. It also assumed a finer superficial appearance, a greater luster and an increased affinity for dyestuffs.

At one time it was thought that an application of this process to cotton cloth would be of great value to the textile industry, as is evident from the fact that Mercer was made an offer of $200,000 for his patent in 1852, which he refused to accept. The cloth, however, shrank 20 to 25 per cent in length as well as in width, and this, together with the fact that its increase in durability would tend to make the call for fresh supplies less often, led to its abandonment at that time, although modern developments have again brought it into use.

Mercerization Under Tension

The mercerizing process has proved of value for purposes other than those originally proposed by Mercer, and the principal use at the present time, and undoubtedly the most important application ever made, is that of producing a silk-like luster on cotton yarn by mercerizing it in such a way that it cannot shrink.

The great value of mercerization for the production of a silky luster, both upon yarn and, to a less degree, upon cloth, seems to have entirely escaped the attention of Mercer, as well as all other experimenters for nearly fifty years.

During the period from 1889 to 1904 there was a great renewal of interest in mercerizing processes, and during that period numerous patents were taken out in regard to various phases of its application.

The greatest advance of all was made by Lowe, who discovered that a high luster could be developed when cotton material was mercerized under tension. Thomas and Prevost, who had been working along similar lines, apparently unaware of any work done by Lowe, were granted patents, but after litigation lasting through a period of many years the patent rights of Thomas and Prevost were invalidated and to-day practically all applications of mercerization are open to the public.

The various processes for obtaining this silky luster differ mechanically in the method of preventing the shrinkage, but the general principles involved are the same in all and are as follows:

The mercerizing bath consists of a caustic soda solution kept commonly at a Sp. Gr. between 50 and 70 deg. Tw. Solutions of a Sp. Gr. of less than 15 deg. Tw. have little if any action For the best results the temperature should remain low, about 15 deg. Cent. and not over 20 deg. Cent. In general, it may be said that mercerizing action increases with the strength of the caustic solution and decreases as the temperature increases.

The time of immersion is of little consequence so long as the yarn is thoroughly saturated. From thirty seconds to one minute is usually long enough in the case of cloth, but a somewhat longer time is usually required for yarn. The yarn is commonly under tension when it enters the mercerizing bath, but in some methods it is subjected to tension upon being taken from the bath. In either case, however, it is necessary that the tension be applied while the yarn is saturated with caustic soda solution, and this must be washed from the yarn before the tension is relieved.

Although all cotton receives more or less luster upon mercerization under tension, it is only long staple cotton, such as Egyptian and Sea Island, that appears to receive sufficient luster to make its mercerization practical for this purpose. Furthermore, only two-ply or multiply yarns are improved by mercerization, as yet no process having been devised for producing a satisfactory luster on single yarns. The gassing or singeing of the yarn before it is mercerized also seems to add materially to the luster of the finished product. Gassing consists in rapidly passing the yarn through a gas flame for the purpose of singeing the projecting superficial fibers.

Other Applications of Mercerization

At least two other applications of mercerization have proved of importance:

First—The production of seersucker effects by two methods: Method A—By printing on a cotton cloth a narrow stripe of caustic soda paste. The cloth shrinks where the caustic soda comes in contact, and when washed and finished a seersucker effect results. Method B—This method produces similar results, but it is accomplished by printing upon the cloth a stripe of British gum or some other substance which will resist the action of caustic soda for a short time. When such printed cloth is passed through a caustic soda solution, the unprinted portion becomes mercerized and shrinks, but the portion printed with British gum resists the action of caustic soda and does not shrink.

Second—The production of two-color designs by printing a figure on cotton cloth with a caustic soda

(*Continued on page* 131.)

Notes on the Dyeing of Direct Blacks on Cotton Piece Goods

Part II

Preparations and Equipment for Diazotizing and Developing—Mode of Operation—Advantages of Combining Two Plants—Modified Arrangement to Permit of Changing Dye Bath While Running—Plant for Diazotizing Direct Black with Nitrous Fumes Under Pressure—General Hints on Operation

By RAFFAELE SANSONE

(*Note— Part I of this article appeared on p. 402, issue of June 5*)

Diazotized Blacks

A CERTAIN number of direct blacks, dyed on cotton cloth goods through the ordinary methods, can be advantageously diazotized with nitrite of soda and hydrochloric acid, and developed with such products as beta-naphthol, resorcin and meta-toluylene diamine. In this instance the fabrics, dyed in the direct colors, are treated before drying in the cold for about one-half hour with a bath containing from 2 to 5 per cent of nitrite of soda and from 5 to 7½ per cent of hydrochloric acid, or from 4 to 5 per cent of sulphuric acid, on the weight of the goods, and developing after rinsing in a cold bath for one-half hour with a solution of the above developing agents.

The nitrite is first dissolved in a little water, and the resulting strong solution thus formed is added to the bath for treating the material, in which is then entered the sulphuric acid or hydrochloric acid. If the bath has already been employed, only one-third of the above quantities is used. For determining if the bath is still capable of diazotizing, a small bit of filter paper impregnated with starch paste and potassium iodide is introducer, which should at once turn blue. Besides a similar trial the smell of the nitrous acid in the bath is another valuable indication. It is not necessary to whiz or wring off after diazotizing. The goods are often allowed to drain before rinsing them in water and immediately developing. The goods should not be left too long in the intermediate stage between the

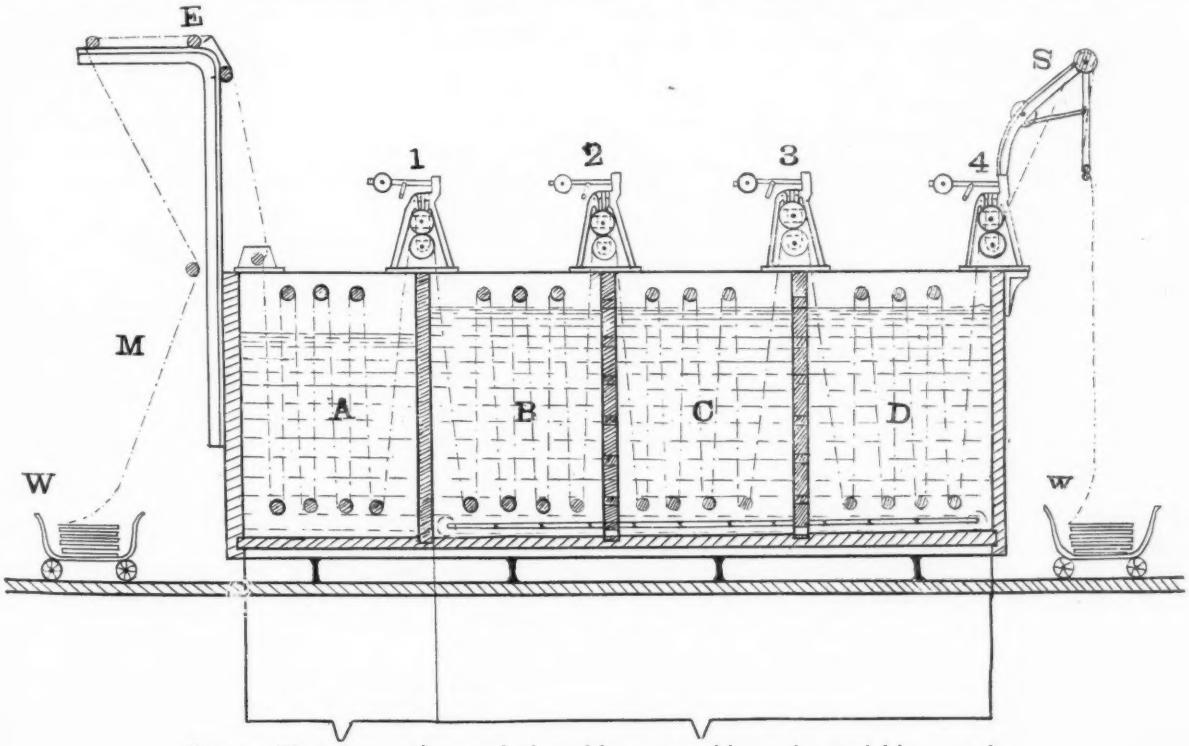

Fig. 1—*Plant for continuous dyeing of large quantities o f material in one color*

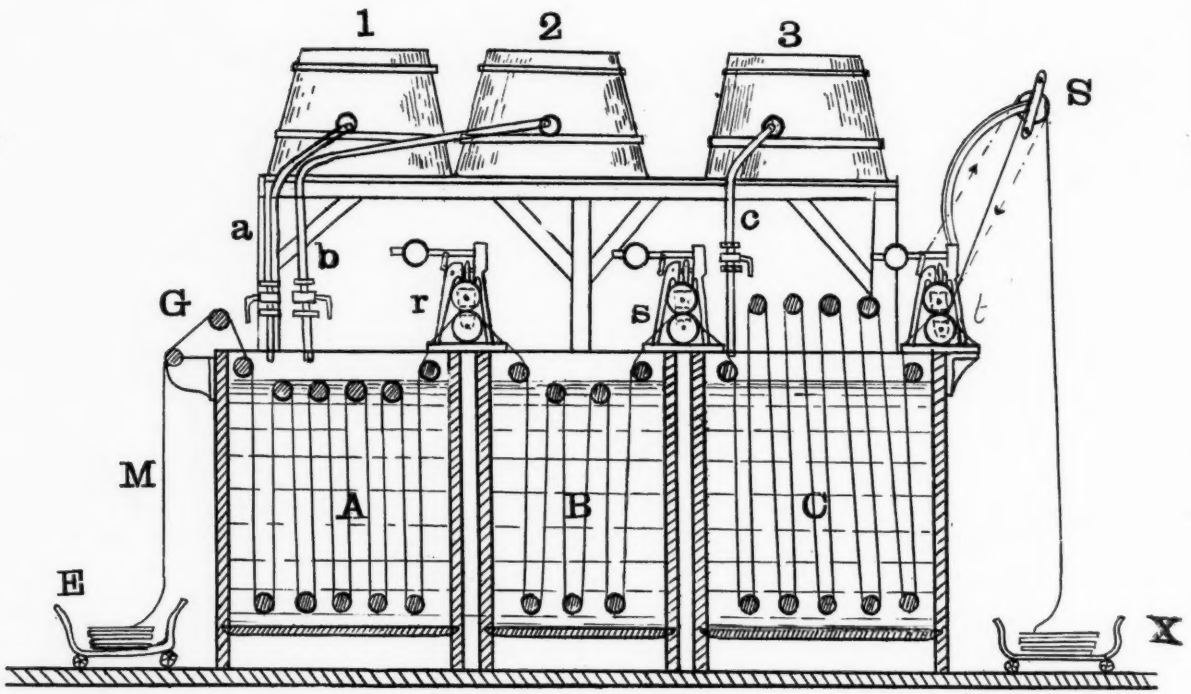

FIG. 2—*Continuous diazotizing and developing plant*

diazotizing and the development operations, nor should they be exposed to glaring daylight.

PREPARATION OF DEVELOPING BATHS

When beta-naphthol is used for the developing operations, 1 per cent of this substance is dissolved in 2 per cent of caustic soda lye of 22 deg. Be., whereas with meta-phenylene diamine, 0.7 per cent of this substance is dissolved with 0.7 per cent of carbonate of soda; and with resorcin 0.6 per cent of this product in 2½ per cent of caustic soda lye at 22 deg. Be.

If the developing baths are employed continually, the quantity of developer is reduced by about one-quarter, and when working with very dilute baths—for example, more than twenty times the weight of liquor as of goods—a correspondingly larger addition of developer in solution is needed. In order to vary the shades of the developed dyeings, some developers may be mixed with others; for instance, beta-naphthol can be mixed with resorcin, beta-naphthol with phenylene diamine, and phenylene diamine with resorcin. For shading the developed blacks, topping with basic colors is sometimes resorted to, and this is carried out in the same manner as with the direct dyeings. In some works the basic colors for the topping may be added to the diazotizing liquor.

ADVANTAGES OF DIAZOTIZING AND DEVELOPING

The diazotizing and developing of direct coloring matters, and especially of blacks, greatly increases the intensity of the dyeings and changes their shade, improving their fastness to washing, to light and to acids. When diazotizing in a very short liquor on the dyeing machines, or in the jigger, smaller quantities of nitrite of soda and hydrochloric acid will be found sufficient for obtaining the full effect.

ADDITIONS AND MATCHING

An addition of sulphate of copper is sometimes made to the diazotizing bath, or an after-treatment of the developed dyeings is conducted with sulphate of copper for improving the fastness to light. With respect to the matching off of after-treated dyeings when carrying out the methods of after-treatment already stated, the matching is best conducted by taking small samples of the goods and subjecting these to the after-treatment, and drying and comparing them with the goods to be matched. In the case of shades which are often repeated, a sample of the dyeings before the after-treatment may be preserved, all following lots then being dyed and matched in accordance with this sample.

THE PLANT EMPLOYED

In those dyeworks where most dyeing operations are conducted on the jigger, the diazotizing and developing operations are conducted through the use of this machine, using somewhat more concentrated

baths of nitrite of soda, hydrochloric acid and developer. In this instance the cotton fabrics are first dyed on a portion of the jiggers in the required black or dark gray, being rinsed after this on a second series of jiggers, diazotized on a third series, rinsed a second time on the same series of jiggers as before, developed on a fourth series of jiggers, given the last rinsing on another series of jiggers, and finally soaped on a last series of jiggers. This plan of treatment permits very large production, and when not dyeing the cotton pieces with diazotized blacks the same jiggers can be easily employed for dyeing other blacks or for conducting other dyeing operations. The cost of the labor required in this instance is, however, excessive, and the production is less large than when employing other continuous dyeing machines.

A Plant for Continuous Treatment

A plant for the continuous dyeing, diazotizing and developing of cotton cloth consists generally of two portions; that is, of a dyeing machine and of a diazotation and developing plant. A dyeing plant that has found a certain employment, especially when it is required to treat very large quantities of material in one color, is shown in *Fig.* 1.

This shows a strong wooden vat divided by partitions into four compartments (A, B, C, D), each supplied with upper and lower guiding rollers, and with a pair of pressure rollers (1, 2, 3, 4). The first three compartments contain a long, closed steam-heating coil. The material (M) arriving on a small truck (W) is entered in the machine through a fold or plait elimination frame (E), and after passing in the same makes its exit through a special distribution frame (S) which distributes it on a second delivery truck (w) in piece form. The first, second and third compartments contain a dye bath coming from a single preparation vat, whereas the last is supplied with rinsing water.

The Working of the Plant

The workmen enter the fabric in the usual way—that is, through the use of a cotton or hemp tape—after having prepared the dye bath in the vat already indicated and having distributed it, through special taps, in the first three compartments (A, B, C) so as to run this out regularly by overflow tubes and having caused a stream of clean running water to run through the last compartment (D). This is then run slowly through the plant, taking up in the first compartment sufficient coloring matter for producing a medium gray. On entering the second compartment from the pressing cylinders (1) the medium gray is transformed into a dark gray; the second pair of squeezing rollers then lead the material into the third compartment (C), where all excess of bath is pressed out, and the cloth makes its way into the rinsing compartment (D), which eliminates all unfixed color, sending through the pressing rollers (4) and up to the plaiting frame (S) a clean and nearly black fabric ready for the following diazotizing and developing operations that produce the jet-black.

Diazotizing and Developing Plant

The diazotizing and developing plant often consists of the continuous treating machine shown in *Fig.* 2.

This shows three strog wooden vats (A, B, C) placed very close together, the first of which (A) is destined for the diazotation with nitrite of soda and hydrochloric acid, the second (B) for rinsing with clean running water, and the third (C) for treating with the developing bath. The first vat (A) is surmounted by two tubs (1 and 2), the first of which delivers at its beginning, through a tap (a), the bath of nitrite of soda necessary for the diazotizing operations, whereas the second (2) delivers through another tap (b) the hydrochloric acid solution that is to decompose the

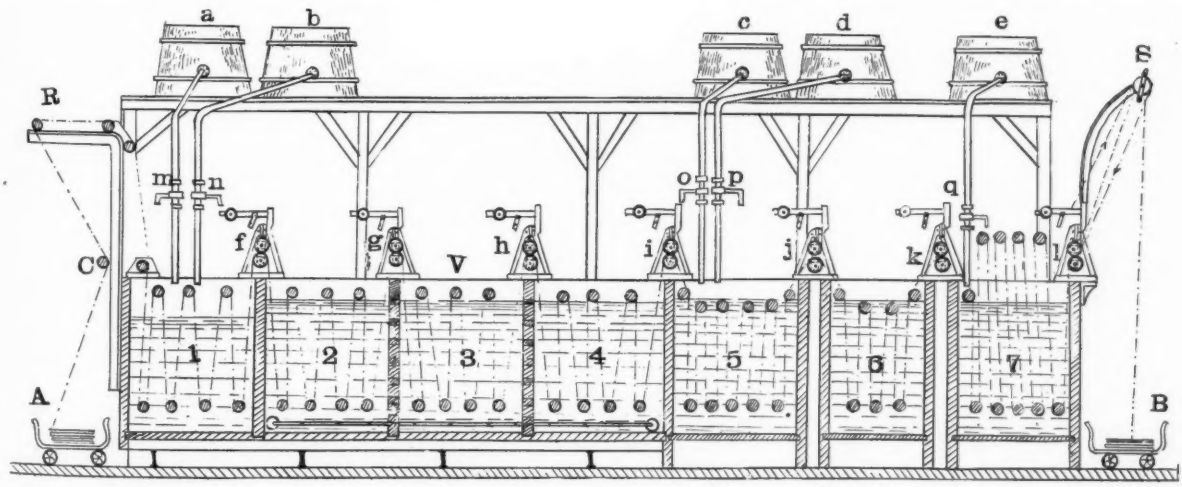

Fig. 3—*Combination of plants illustrated in Figs.* 1 *and* 2

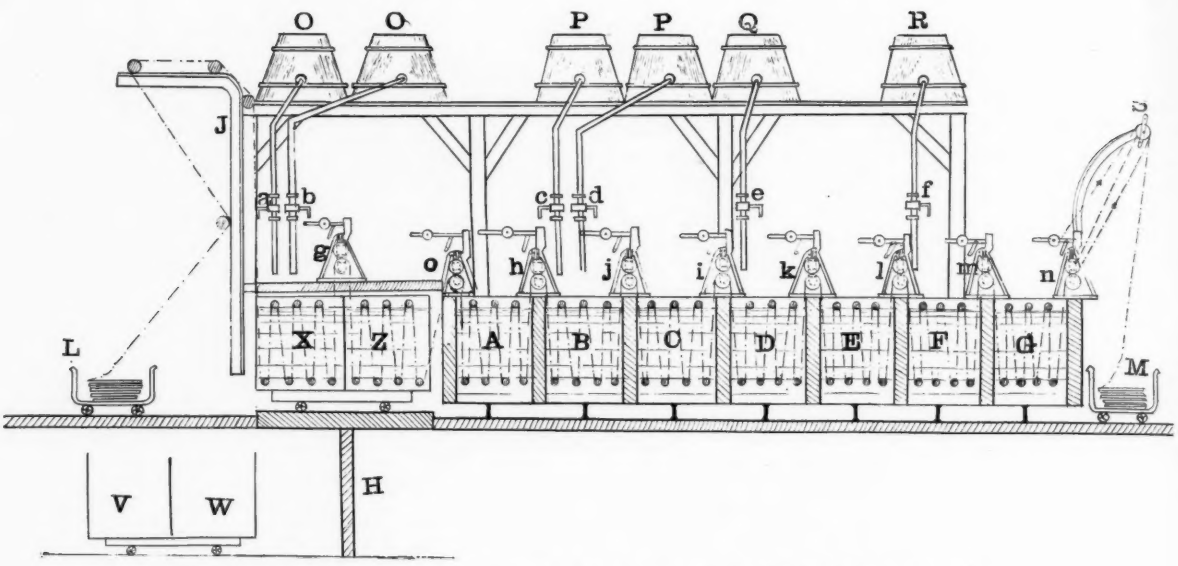

FIG. 4—*Modifcation of Fig. 3 permitting change of dye baths during operation*

former, developing the nitrous acid necessary for the treatment of the goods. At the extremity of each vat are fixed a pair of squeezing rollers (r, s, t). Above the third vat (C) is placed a third tub (3), in which the developing bath is prepared, which is led in the same through a third tap (c). The material (M) coming from the small truck running on wheels (E) is entered in the plant at (G) through three narrow diametered rollers and, after having been run up and down several times in the different baths through upper and lower series of guiding rollers and having been pressed between the three pairs of squeezing rollers (r, s, t), makes its way out through a folding disposition (S) that folds it on a second truck (X) in the form of pieces, ready to be conducted to the rinsing and soap plant. The middle vat (B) serves for an intermediate rinsing of the cloth.

THE WORKING OF THE PLANT

The working of the plant would be as follows: The workmen pass a tape through the machine and prepare a bath of nitrite of soda in the first tub (1), a bath of weak hydrochloric acid in the second tub (2), and the developing bath in the third tub (3). After which they place a certain quantity of water in the first and third vats (A and C), entering running water through the middle vat (B), and cause a thin stream of the solution in the three tubs (1, 2, 3) to run slowly in the first and third vats.

The machine is then placed in movement for bringing through the cotton tape, the dyed cotton fabric (M), that comes thus to run slowly through the diazotizing bath, remaining entirely submerged in the same until reaching the first pair of pressure rollers (r). After this it is rinsed in the middle vat (B) and, after being pressed between the rollers (s), enters in the developing bath contained in the third vat (C), from which the black fabric rises for being pressed for a last time and brought out, through the folding disposition (S), on the small truck just below (X).

AN IMPROVEMENT

There is no doubt that a certain improvement could be brought on the above two plants by combining these in one for saving in space and labor. In *Fig.* 3 is given an idea how the combination could be effected.

This shows a long wooden vat (V) divided into five compartments (1, 2, 3, 4, 5) through wooden partitions and placed quite close to another pair of separate compartments or vats (6 and 7). Each compartment contains also, in this instance, a pair of squeezing rollers (f, g, h, i, j, k, l) and a series of upper and lower guiding rollers. The first four compartments (1, 2, 3, 4) contain a steam coil for the warming of the respective baths, a discharge tap and an overflow tube. Two tubs (a and b) are placed above the first compartment, where two separate dye baths can be prepared, one for the immediate treatment of the material and another for following dyeing operations. These tubs, through two taps (m and n), also lead in the dye bath at the beginning of the first compartment. The first three compartments (1, 2, 3) serve in this instance for the dyeing operations with the direct black, whereas the fourth (4) serves only for the rinsing with running water. The fifth compartment (5) serves for the diazotation process, and two tubs (c and d) lead in the same, through two taps (o and p), the bath of nitrite of soda and of hydrochloric acid. The sixth compartment (6) serves for a second rinsing, whereas the seventh (7) serves for the treatment with the developing

bath that is prepared in a fifth tub (e) and runs in through another small tap (q).

The cloth is entered also in this case from a small truck (A) and, after passing against a guiding roller (C), rises in the spreading frame (R) for descending from here into the first dyeing compartment (1). The cloth makes its exit through the folding disposition (S) that forms with it pieces on a second truck (B).

Working of the Plant

The working of the above plant would be conducted as follows: The workpeople pass, first of all, a long cotton tape through the whole of the plant, entering after this running water in the rinsing compartments (4 and 6) and water up to a certain height in the other compartments (1, 2, 3, 5, 7). When this has been conducted they prepare the different baths in the tubs (a, c, d, e), sustained on the frame at the top of the plant, causing a certain quantity of each bath to run continuously in the compartments just below through the taps (m, o, p, q).

At this point the plant is placed in movement for entering the cloth that thus passes slowly from compartment to compartment, being first dyed to a dark gray, then rinsed, diazotized, again rinsed, and finally developed into a fine black. The truck of dyed material (B) then brings this to another plant, where further rinsing and soaping operations are conducted that prepare the material for the drying and finishing operations.

Disadvantages of Plant

From the above it will be seen that the plants indicated above do not accomplish the complete treatment of the material, but leave over rinsing and soaping operations which have to be conducted on another plant, with further employment of labor, time, motive power and space. Moreover, when a color is to be changed the whole plant has to be stopped and the three compartments (1, 2, 3) are to be emptied, passing out the whole of the last piece being treated and running through the cotton tape already indicated.

Such inconveniences would some years ago have been a matter of little importance, as the majority of dyeworks were on an even more wasteful scale; but at present the case is quite different, and every producer of dyed cotton goods tries his best to secure all possible advantages in the plants he uses. For this reason a further improvement upon the above plants would certainly be looked upon favorably. This could be effected, as shown in *Fig.* 4, where the cloth leaves the machine for passing directly on to the drying machine and the dye baths can be changed during the running of the plant.

This shows a long wooden vat divided by partitions into seven compartments (A, B, C, D, E, F, G), surmounted by eight pairs of squeezing rollers (o, h, j, i, k, l, m, n) and each having an upper and lower series of guiding rollers. The end of this vat contains the usual cloth folding disposition (S) for leading the material onto a delivery truck (M) and is joined at its beginning to a strong wooden framing supporting another pair of squeezing rollers (g).

Below this framing a separate vat having two compartments (X and Z), and arranged for running on rails, can be lifted or lowered to the same height as the other compartments (A, B, C, D, E, F, G), or can be lowered through a special arrangement (H) for

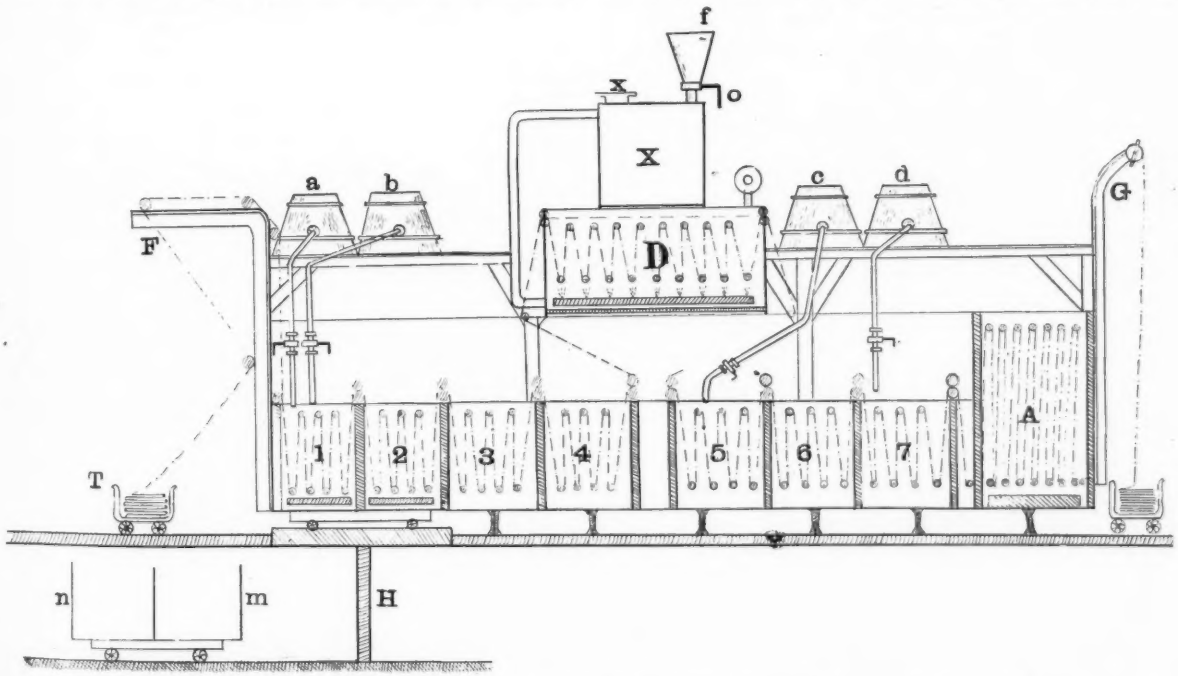

Fig. 5—*Special plant for diazotizing direct blacks with nitrous fumes under pressure*

reaching the level of a flooring on a story below, where another two-compartment vat (V and W) can be substituted to it at any time.

Before the framing, already indicated, is fixed an entrance arrangement (J) that leads in the cloth coming from a small truck (L). Two taps (a and b) lead into the first compartment of the vat (X, Z) the dye bath of the one or of the other tub (O, O) at the top of the plant, whereas the tubs (P, P) lead in the fourth compartment (B) of the large fixed vat, through two taps (c and d), the nitrite of soda and hydrochloric acid necessary for the diazotizing operations. Another tap (e) leads in the fourth compartment (D) of the said vat and developing bath contained in tub (Q), and another tap (f) serves for delivering in the sixth compartment (F) the soap bath contained in tub (R) and required for neutralizing the last traces of acid left in the goods and giving these a slight scroopy effect or finish.

Working of the Plant

The working of the plant is not very complicated. The operatives prepare the different baths in compartments (X, Z, B, D, F), regulating the taps (a, b, c, d, e, f) for keeping the former always at a sufficient height for not flowing out through overflow tubes at the back of each compartment, and enter the rinsing waters in the compartments (A, C, E, G). When such operations have been conducted they lead in the cloth coming from truck (L) through the aid of a hemp tape. This is then dyed, rinsed, diazotized, again rinsed, developed, rinsed a third time, soaped and rinsed a fourth time, making its way out on truck (M) ready for leading to the drying department. When the color has to be changed the workpeople have only to add a waste piece at the end of the last piece treated, lowering the vat (X, Z) as soon as the whole of the same has passed through this last and replacing the said vat by the other (V, W), in which the fresh dye bath has been prepared, in the meanwhile tap (a) leading in till then the dye bath from one of the tubs (O) is closed and that of its neighbor (b) is opened for replacing all dye bath that is taken up by the cloth running through. During the period of time that thus elapses, the rinsing water in the compartments (A, C, E, G) loses coloring matter, diazotizing bath, developing bath or soap bath, so that by the time the new color passes through them there is no danger of tinging or staining. In this way no loss of time follows and no intermediate stoppage of the machine is necessary.

Possible Future Modifications

The future, through the enterprise of capitalists, practical people and chemists, is likely to bring further changes in the diazotization and development of direct blacks looking to securing further advantages and concentrating as much as possible all treatments to which cotton cloth goods are subjected. Among such changes will undoubtedly be that of diazotizing direct blacks with nitrous fumes under pressure. For accomplishing this a special plant will, however, be necessary in which entirely new principles are adopted. Some experimentation will be required before the best results can be attained.

A plant that could be used for this purpose, which also possesses the marked advantage of allowing the entrance of the gray boiled-out material and its exit in a dry condition after the treatment with the dyestuff, diazotation, development and soaping baths, could be constructed on the principle shown in *Fig* 5.

This consists of two long wooden or iron glass-lined vats, the first of which is divided into four portions (1, 2, 3, 4) and the second into three portions (5, 6, 7). At the end of the second vat is placed a drying oven (A) and a frame (G) for the distribution of the cloth to a small truck. The cloth is entered in this instance in the plant from another truck (T) by a second frame (F). The dyebath is distributed from one of the tubs (a and b), the developing bath from a third tub (c) and the soap bath from a fourth tub (d). The plant for the diazotization of the cloth (D) consists in this instance of a closed iron glass-lined rectangular vat having at its bottom a gas distribution coil and at its upper portion a pressure gauge, an entrance pair of squeezing cylinders and an exit pair of squeezing rollers. The interior of the vat contains an upper and lower series of guiding rollers. The gas for the treatment of the cloth is led to the distribution coil through a lead tube fixed to the upper portion of a nitrous acid generation plant (X).

This consists principally of a cubical glass-lined iron vessel having on its upper portion an opening for the entrance of the nitrite of soda, covered by a hermetically closing door (x) and a special form of funnel (f) supplied with a tap (o) for the entrance of the hydrochloric or sulphuric acid required for the decomposition of the said salt. Below this tap a special disposition avoids that the pressure created by the generation of the nitrous fumes should spurt out the acid, and that lets further acid fall when the pressure has been reduced.

Operation Complicated

The cloth coming from the first four compartments (1, 2, 3, 4) rises for entering at the front of the diazotation case (D) and, after running through the same in a bath of water, acidulated or not, makes its exit from the same for descending to the developing department (5), after which it makes its way through the rest of the plant. The plant is also supplied with a lowering disposition (H), through which the dye vat (1, 2) can be brought to a lower story and exchanged with another vat (n, m) when it is necessary to change the dyeing color.

The working of the above plant would certainly be

more complicated than with any of the others hereinbefore indicated, and on the way it is conducted would depend principally its success. The operatives, after having passed a tape through the whole plant, would prepare the different baths in the compartments (1, 2, 3, 4, 5, 6, 7) and tubs (a, b, c, d), placing in function the warming medium of the drying oven (A). When this has been effected, they place in function the diazotizing compartment by entering water in the vat (D), with or without acid, as may be necessary, nitrite of soda through the cover (x), and hydrochloric acid through the funnel (f), by opening the tap (o) below the same.

At this point the plant is placed in movement, drawing the cotton cloth slowly through the dye bath (compartments 1 and 2), then through two rinsing baths (compartments 3 and 4), then through the diazotizing case (D), then downward through the developing bath (compartment 5), then through another rinsing bath (compartment 6), then through the drying oven (A), and finally out of this in such a form that it can be carried at once to the finishing department of the works for being given the final touches that are to prepare it for the client or merchant. The lowering disposition (H) is worked when it is necessary to change the dye bath during the running through of the goods; what takes place also in this instance through joining a waste piece between the end of the last piece being treated and that of the new piece to be dyed in another color, in this case the vat (1, 2) being substituted by the vat (n, m).

Advantages of the Plant

The advantages of the above plant are several, and may be indicated as follows:

1. There is a great saving of labor, time, space and chemicals in comparison with most dyeing, diazotizing and developing operations conducted with the present means.

2. Contact of the material with the nitrite of soda and hydrochloric acid or sulphuric acid is avoided, permitting the production of superior blacks.

3. The treatment with nitrous fumes under a certain pressure allows a more thorough and rapid treatment of the material than is usually possible.

4. No intermediate manipulation of the material is necessary between each treatment to which the cotton piece goods are subjected, as this proceeds quite continuously and automatically and with the greatest accuracy.

5. The escape steam coming from the steam coils at the bottom of the dye baths serves for the warming of the drying oven (A), reducing the cost of the treatment, which would be already low for the reasons already exposed.

6. The color being dyed, diazotized and developed cannot only be substituted by another black but by any other color required, without there being any danger of spoiling the shade or tinting it through the exchange of dye vats.

7. When not diazotizing through introducing a steam coil in the fifth compartment (5), the plant can also be employed for colors that are chromed or coppered; providing, of course, that when again diazotizing a thorough cleaning of the latter be conducted.

(*Part III will appear in a future issue.*)

CHINA PREPARING OWN SILK SHOW TO BE HELD IN FALL

The most important revolution in the world, it has been said, occurred in China when the first silkworm turned. This was several thousand years ago, but the movement is still going on.

News has just reached America that in spite of political disturbance China is preparing a great "silk exposition," the first of its kind ever held in the native country of sericulture. It will be opened in Shanghai in October, under direction of the Shanghai Chamber of Commerce.

Historical material of great value and beauty will be displayed, including some of the most ancient silk fabrics in existence. The exhibit of ancient art will be surrounded by a modern commercial exhibit, showing the Chinese raw silk industry and arts of weaving, dyeing and embroidery.

The primary purpose behind the opening of this exposition is to assemble a large and representative body of material to be sent to New York as the Chinese section of the Second International Silk Exposition in Grand Central Palace, February 5 to 15, 1923. The Chinese committee in charge of selecting the New York exhibits will be assisted by D. E. Douty, special commissioner to the Orient for the Second International Silk Exposition.

Speaking of Mr. Douty's work in China, Charles H. Green, managing director of the Second International Silk Exposition, said:

"With a view to receiving the benefit of the friendly feeling and deep commercial interest that is known to exist in China for American trade, the exposition management early in the present year appointed D. E. Douty, vice-president and general manager of the U. S. Testing Company, Inc., of New York, and general manager of the Shanghai Testing Company, of China, special commissioner to the Orient, for the purpose of visiting the principal industrial centers to give word of mouth presentation of the requirements of the American trade and the benefits to Chinese merchants in meeting these requirements. Mr. Douty's trip has taken several weeks, and with the aid of an American secretary, a Chinese interpreter, and a motion picture operator he has been able to arouse such widespread interest as will insure the most marvelous display of Chinese art and needlework ever seen in this country."

Bleaching of Cotton Piece Goods

Early Methods—Nature of Cotton—Removing Sizing—Types of Kiers—Use of Bleaching Powder—Liquid Bleaching Solution—Titration of Bleaching Solutions—Open and Continuous Bleach—Other Forms of Bleaching—Determining Quality

By WILLIAM A. BAILEY

BLEACHING may be defined as the removal from cotton, of all its natural constituents other than cellulose, together with any adventitious impurities which it has acquired during the process of manufacture, and leaving a residue of pure cellulose.

Early Bleaching Methods

Ever since textiles have been known, they have been bleached. The earliest method was pounding them with water, and then exposing them to the sunlight. A little later, cotton was boiled with the juice of certain plants before being exposed to the sun's rays. With the development of the cotton weaving industry, came the development of the bleaching industry. Until almost the end of the eighteenth century, all commercial bleaching was done by boiling the cloth in lye made of the ashes of plants, then exposing it to the bleaching action of the sun. In about 1840 kiers for boiling out the goods came into use. For washing—the feet were used for treading, then the domestic dolly, the dash wheels and finally the roller washing machines.

The first bleaching machines were supposed to be brought into use by Ridgway and Bridson. The next improvement was the use of vitriol (H_2SO_4) in place of buttermilk for souring, the introduction of lime for boiling and most important of all—the use of chlorine compounds as bleaching agents. These improvements were discovered before 1865. Since that time, there have been certain improvements, but the general methods and chemicals used are not changed a great deal.

The Nature of Cotton

Dried Cotton contains about 95 or 96 per cent cellulose. The other 4 or 5 per cent is made up principally of pectin, cotton wax, cotton oil, albuminous matter, coloring matter, and a small amount of mineral matter. The United States Department of Agriculture gives the following analysis of raw cotton fiber:

Water	6.74%
Ash	1.65
Protein	1.50
Fiber (cellulose)	83.71
Nitrogen free extract	5.79
Fat	0.61

It might be expected that different varieties of cotton would have different composition, but it has been found that there is no greater variation than there is in different samples of the same kind of cotton.

The pectin compounds form the greater portion of the impurities present in cotton. They are gumlike substances, derived from the cell juices of the plant. Pectin is supposed to be a derivative of pectic acid with metallic salts, and calcium pecta is one of the chief ingredients of the gums which cement together the cells of woody tissues.

Cotton wax appears to be closely analogous to carnauba wax. It is gradually emulsified by long boiling in alkaline solutions. This coating of wax on the cotton fiber influences its spinning qualities to a considerable extent. The fatty acid present in cotton has been found to be identical with margaric acid. American cotton contains about 0.84 per cent of the acid.

Cotton oil is apparently identical with cotton seed oil, and it is found in the cotton, because some of the seeds become crushed in ginning it, and thus contaminate the fiber with more or less oil.

Albuminous matters are present in raw cotton only to a slight extent. They vary from 0.29 to 0.42 per cent nitrogen. Practically nothing is known of the chemical constitution of these albuminous bodies except that they contain an amino group.

Coloring matter is present to a small extent in cotton, and gives the fiber a slight yellowish brown tone. This coloring matter is an organic pigment which is insoluble in water, and only slightly soluble in acid and alkaline solutions.

Mineral matters are present from 1 to 1.25 per cent. They are removed almost entirely by boiling out and bleaching.

The general principles involved in the bleaching of cotton vary according to the use to which the goods are to be put. When cotton cloth comes to the bleach house, it contains sizing which must be removed. This can be carried out in one of two ways. It may be diastafored, or put through a scouring, or boiling-out operation. The cloth is then thoroughly washed, and then treated with a suitable bleaching agent, such as chloride of lime, sodium hypochlorite or sodium peroxide. This process decomposes the small motes, and destroys the coloring matter present in the cotton. It is given another thorough washing, and then treated with dilute acid for the purpose of

dissolving out all particles of lime, and to decompose the hypochlorite of lime still left in the cotton. It is very important that all of the acid be washed out to prevent tendering the cloth. Sometimes the cloth is then treated with a weak soap solution to neutralize the last trace of acid in the goods.

Method of Removing Sizing

The first method for removing the sizing from the cloth is by treating it with a solution containing the enzyme, diatase, which hydrolyzes the carbohydrates, fats, protein substances and fatty acid esters, forming new substances which are soluble in water, and can be easily washed out of the cloth. Diastase compounds come into the market under various names, such as diastafor, diamalt, orzil, maltine, unomalt, multomalt, zellomaltin, polyzine, etc.

The second method for removing the size is by far the more important. It consists of piling the goods, which are in rope form into a large tank or kier, and boiling them with alkaline solutions with or without pressure. The composition of the alkaline solution varies according to the use to which the goods are to be put. The goods which are to remain as white goods are usually boiled in a solution of lime and soda ash, although in some cases caustic soda and soda ash are used. For work which is to be printed or colored, it has been found that a caustic soda boil is best. It is decided to avoid the use of lime on account of resists caused by the formation of calcium sulphate which is insoluble in water. For goods containing colored yarn in the gray, it is advisable to use an open bleach without pressure, and to avoid piling them in a kier so that the color may mark off onto the white.

Below is a comparison of cloth given a caustic soda boil, and cloth given a lime boil:

Constituents	Caustic Soda Boil	Lime Boil
Ash	0.26%	0.52%
Free fat	0.10	0.26
Fatty acid as soap	0.16	0.22
Nitrogen	0.05	0.70

Various Types of Kiers

The kier is the most important piece of apparatus used by the bleacher. The simplest form of kier is the ordinary household wash boiler, in which goods are placed, and heated by a fire underneath. These, of course, are not used by bleachers to-day, but it is interesting to note that before cotton cloth was as common as it is now, bleaching was carried out in this sort of kier. Modern kiers are of five general types. They are as follows: vomit type, Jefferson, vertical kier, Mather Platt and the continuous type.

Vomiting Kier.—This is a large upright steel tank which is piled full of cloth. The alkaline solution or kier liquor, as it is called, is poured into the top of the tank periodically. It soaks down through the tank full of goods, is drained out through the bottom of the tank, and then by means of a mechanical pump, it is forced through an external tubular heater and then into the top of the tank again. This process is continued for about twelve hours in order to remove all the sizing from the cloth.

Jefferson Kier.—This kier differs from the vomiting kier, in that a small receiver is placed alongside the kier, into which the lye passes from the kier. It is claimed that by means of the alternate compression of the cloth produced by the suction, when the lye passes into the kier, a better boiling effect can be produced in a shorter time.

Vertical Kier.—In this type of kier the liquor drains through the bottom of the tank, and is circulated by means of an injector which forces the liquor through a puffer pipe in the center of the tank. This works very much the same as a coffee percolator.

Mather Platt Kier.—It is made in the form of a horizontal iron cylinder with a large door at one end. The goods are saturated through, with alkaline solution, packed on trucks which are run into the kier through this large door. It has an external contact heater and circulation is maintained by a centrifugal pump, which continuously draws the liquor from the kier and sprays it again onto the goods. Each kier is provided with two sets of trucks in order that, while one set is being treated, the other set may be emptied and refilled. The heating is brought about by means of direct steam, injected through perforated pipes.

Continuous Type.—This kier has not been found at all satisfactory. It consists of an upright rectangular tank containing rollers near the top and bottom. The boiling liquid is poured into the tank and the cloth which is in rope form, in passing from one roller to another, is repeatedly dipped into the boiling solution. It then passes out through the top of the tank and is ready for the next process.

The Use of Bleaching Powder

After the alkali boil has been completed, the cellulose will contain only a small amount of coloring matter. This can be transformed into a colorless substance by means of nascent oxygen. The chief bleaching agents are as follows: Chlorine, Peroxide of Sodium or Hydrogen and Perborate of Sodium. Of these, Chlorine is by far the most important and most used. It is used in the form of bleaching powder and liquid chlorine.

Bleaching powder is a double chlorine and hypochlorite of calcium. It is prepared by saturating slaked lime with chlorine gas. Below is an analysis of bleaching powder made from pure lime under the best conditions.

Available Chlorine	43.13
Chlorine as Chloride	9.29
Lime	39.89
Carbon Dioxide	0.42
Water	17.00

An average analysis of commercial bleaching powder is given below:

Available Chlorine	36.00
Chlorine as Chloride	0.32
Chlorine as Chlorates	0.26
Lime	44.66
Magnesia	0.43
Peroxide of Iron	0.02
Alumina	0.33
Oxide of Manganese	Trace
Carbonic Acid	0.48
Siliceous matter	0.50
Water and loss	17.00

In making the bleaching solution from the bleaching powder, it is important that the solution be free from suspended particles, because, later in the process, these would become entangled in the cloth and cause over-bleaching—which is changing of the cellulose to oxycellulose. The solution is made in the following way: The bleaching powder is mixed in large tanks with water at about 75 deg. Fahr. It is then mechanically agitated for about twenty minutes. The undissolved particles are allowed to settle, and then the clear liquid is run off from the top. This clear solution is now ready for use in the bleaching process.

Use of Liquid Bleaching Process

A liquid chlorine bleaching solution is taking the place of bleaching powder in some parts of the country. It is made by electrolyzing a solution of common salt. The gas which is liberated is liquefied by a reduced temperature, and an increased pressure, and is stored in steel cylinders which are large enough to hold 100 pounds of the liquid. The bleaching solution is made from liquid chlorine in the following way: The chlorine is bubbled through large tanks of water, containing soda ash and caustic soda until the action is complete, and chlorine is detected escaping from the surface of the liquid. The caustic soda is added to make the bleaching solution more stable.

There is much to be said about the advantages of liquid chlorine over bleaching powder. Some of them are given below:

1. With liquid chlorine, it is a soda chemic that is formed, whereas, with bleaching powder, it is a lime chemic that is obtained. The soda chemic is considered better because, later on in the process, when the chemic is neutralized with an acid, usually sulphuric, sodium sulphate is formed instead of calcium sulphate. The sodium sulphate is soluble in water and can be easily washed out of the cloth while the calcium sulphate is not soluble, and is rather difficult to get out of the cloth.

2. Another great drawback to bleaching powder is, that it cannot be stored for any length of time without undergoing decomposition. Watson found the following to be true concerning bleaching powder (4). Light, heat, moisture and carbonic acid accelerate decomposition. He found the following loss on storage from experiments carried out in glass bottles:

February to April	Loss 0.33% monthly
June to September	Loss 0.86% monthly
November to January	Loss 0.28% monthly

Greatest loss 1.4% in August

Six months may cause the loss of 3 to 4 per cent available chlorine. To retard decomposition, it should be stored in dark, cool, dry storehouses.

3. There is much greater convenience in handling.

4. A more durable whiteness is formed.

5. Tendering is less frequently found in goods bleached with liquid chlorine.

There is no appreciable difference in the cost of bleaching with bleaching powder or with liquid chlorine, and men who are competent to judge claim that they can see no difference in the color or feel of the goods bleached with soda chemic, as compared with lime chemic.

To obtain a uniform bleach, it is necessary that the strength of the bleaching solution be kept constant. There are two ways of checking this. The first way is by use of the Twaddell Hydrometer. The second is by titration for the percentage of available chlorine. It is a generally known fact that bleaching solutions contain organic matter, calcium chloride and other mineral matter. If soda chemic is used, sodium chloride takes the place of calcium chloride. All of these increase the specific gravity; hence the Twaddell reading gives the impression that the chlorine content of the solution is greater than it actually is.

The following tables were worked out at a large bleachery, and they show very conclusively that it is impossible to obtain an even strength of bleaching solution by use of the Twaddell Hydrometer. The available chlorine content was worked out by titration with arsenious acid:

Deg. Tw.	Grams Available CL per Liter (Actual)	Grams Available Chlorine per Liter (From Tables)
1.0	1.45	2.71
1.0	1.63	2.71
1.0	1.27	2.71
1.0	0.90	2.71
0.8	0.83	2.18
0.9	1.38	2.44
1.1	1.98	2.98
1.1	1.34	2.98
0.9	0.943	2.44
1.0	1.20	2.71
1.1	1.19	2.98
1.0	1.36	2.71
1.0	1.36	2.71
0.6	0.40	0.78

Deg. Tw.	Grams Available CL per Liter (Actual)	Grams Available Chlorine per Liter (From Tables)
1.0	0.79	2.71
1.2	1.59	3.25
1.0	1.59	2.71
0.9	0.58	2.44
1.1	0.49	2.98
1.4	1.30	3.80

Figures in second column from actual titration.

Figures in third column from Lunge & Bachoffen's tables.

There have been several methods proposed for the titration of the bleaching solutions, but there seems to be serious objections to them. It is best to use arsenious acid with starch iodide paper as an indicator.

The stock solution of arsenious acid is made up in the laboratory. The actual titration is done by men in the bleach house. To simplify the control, and save time in figuring results, an arsenious acid solution of 0.282 normality is used. With a ten cubic centimeter sample, reading in cubic centimeters gives directly hundred of one per cent available chlorine. Thus, if the burette reading is twelve cubic centimeters, there are 0.15 per cent available chlorine in the chemic. This figure multiplied by ten gives grams available chlorine per liter.

The 0.282 normal arsenious acid solution is made up as follows: 13.96 grams arsenious acid (As_2O_3) C. P. are carefully weighed out. This is dissolved in 250 cubic centimeters of distilled water which contains 20 grams of anhydrous sodium carbonate (C. P.). The mixture is warmed to bring all the arsenious acid into solution. It is now diluted to about 900 cubic centimeters. A little hydrochloric acid is now added to nearly neutralize the excess sodium carbonate. However, the arsenious acid is left slightly alkaline to prevent it from precipitating out. The solution is now made up to exactly one liter.

For use in the bleach house, 100 cubic centimeters of this stock solution is diluted to one liter. The stock solution should be carefully standardized against a standard N/10 iodine solution. The iodine solution is made up in the following way: 12.7 grams of the purest sublimed iodine in powdered form are weighed into a liter flask. About twenty grams of potassium iodide (free from iodate) dissolved in about 200 cubic centimeters of water are added, and the mixture gently shaken until the iodine is all dissolved. The solution is then diluted to one liter with water at 15 deg. Cent., and preserved in a well stoppered glass bottle in the dark. This solution is used to standardize the stock solution of arsenious acid.

Titration of Bleaching Solution

The titration of the bleaching solution is carried out by the workman who is in charge of the chemic pit. He dips out a sample of the chemic and by means of a pipette, he runs ten cubic centimeters of this into a wide-mouthed bottle. He then dilutes this sample with about twenty cubic centimeters of water. (The reason for this dilution is obvious, with ten cubic centimeters constant spotting on starch iodide paper would use enough of the original ten cubic centimeters of chemic to involve considerable error. With this dilution, the error is considerably diminished.) Arsenious acid is now run into this bottle until a drop of the solution in the bottle no longer produces a blue spot on starch iodide paper. The starch iodide paper has to be kept in a vial to prevent the chlorine fumes of the bleach house from getting at it. When a blue coloration is no longer produced on the starch iodide paper, the reaction is complete, and the workman reads and records on a chart the number of cubic centimeters required for the titration. In this way, an accurate record of the strength of the bleaching solution can be kept. If by this titration the solution is found to be too weak, more strong chemic is added to bring it up to strength. If it is found to be too strong, water is added until the right strength is obtained.

The above system has been used for the last two years with the following results:

1. It is simple to use; i. e., it takes practically no more time than Twaddelling.
2. It is much more accurate than Twaddelling.
3. It may be used equally well on either soda or lime chemic.

The Bleaching Operation

The bleaching solution is piped from the large mixing and storage tanks to the bleach house, where it is used in the various types of chemicking machine. The usual method is to pass the fabric from the washing machine into the chemicking tank by overhead winces.

It is piled in this tank, and the chemicking solution is sprayed on top of it, drained through it, pumped up and sprayed on the top of the tank again. This is continued until the cloth is whitened. Another method for chemicking is to run the goods through a chemicking machine and then pile them in bins. They are allowed to remain in these bins until the chemic, with which they are saturated, has completely whitened them.

There is still another method which is termed "continuous bleach." After the cloth has become whitened, a perfect removal of the excess chlorine is necessary because if it is allowed to remain in the cloth, it causes yellowing with age, and also tendering of the fiber. It is very hard to bring this about by simple washing with water, so it is usually neutralized with a suitable chemical agent. The most used of these is probably sulphuric acid. This is due to the cheapness of the acid. When the cloth containing the bleaching solution comes in contact with the sulphuric acid, the chlorine is set free.

The calcium sulphate is a fine white precipitate which is insoluble in water, and so it is very difficult to wash this entirely out of the goods. For this reason, in some

places, hydrochloric acid is used instead of sulphuric so that calcium chloride is formed instead of calcium sulphate. The calcium chloride is readily soluble in water, and can be easily washed out of the goods. In these reactions the free chlorine which is liberated helps to whiten any part of the goods which may not have been thoroughly bleached before.

When these acids are used to remove the chlorine from the cloth, it is important that enough acid be added to neutralize all of the chlorine and, of course, if too much acid is added, it tends to weaken the cloth.

The strength of the acid generally ranges from 1 to 2 deg. Tw., according to the purpose to which it is to be put. The strength of this should be frequently checked. The Twaddell Hydrometer is usually used, although it is not extremely accurate. A better way is to titrate it occasionally with a standard solution of sodium hydroxide. This can be carried out by the workmen in charge, just the same as the bleaching solution is titrated earlier in the process. For this titration a little phenolphthalein is added to the standard solution, turning it red. This solution is run into a measured volume of the acid, until a pink color is observed in it. The amount of alkali is read, and the strength of the acid is calculated. By this method, the strength of the sour can be kept constant.

Also certain anti-chlors are used to remove the chlorine from the cloth. Sodium hyposulphite and sodium bisulphite ($NaHSO_3$) are the two most important ones.

When these anti-chlors are used, a soluble salt and acids are formed which can be easily washed out of the cloth.

Cotton piece goods may either be washed in the form of a rope or in full widths. The rope washing machine or log washer, as it is called, is the most common. It consists of a wooden roller in a shallow horizontal trough, which is divided into two, three or four compartments. Directly above this trough there are two squeeze rolls. The cloth enters the machine at one end—it is dipped into the water, runs out of the trough and is then squeezed, run back into the trough of water, squeezed again, etc. A very thorough washing with a minimum amount of water is effected in this type of machine, it being worked on the counter-current principle. The fresh water enters at the end of the machine where the cloth is being drawn out, and runs out of the machine at the end where the cloth is run in. By experiment it has been found that a four-compartment machine is the most efficient.

The bleaching operation having been completed, the cloth passes now in the rope form, horizontally, for a distance of about thirty to forty feet. Here it meets a beater, which is revolving in the opposite way to which the cloth is traveling. This beater opens the cloth up from the rope form to the open width. It is run over drying cylinders and is then finished.

Open and Continuous Bleach

The process known as "open bleach" is for the purpose of removing the motes from the cloth as well as partially bleaching it. This is used for cloth which is to be dyed a dark color, especially when it is to be dyed with sulphur colors. In this process, the cloth is run in open width entirely. The machines used are all so-called box machines. The cloth is first diastafored to remove the sizing. It is then scoured in the same kind of a solution as is used in the regular bleach, then chemicked, soured and washed. By this method, it is not possible to get a good white, but it does remove the sizing, motes and part of the coloring matter, so that the cloth can be evenly dyed a dark shade.

Continuous Bleach and Sour.—In this process Gantt piling machines are made use of. These machines are made like a letter J. They are about eighteen feet high, and the vertical section is 22x37 inches. The operation is as follows: The goods are handled in rope form. They are boiled in the kiers, then washed in the log washers. They are then run through a tank containing chemic, and then squeezed to remove the excess. They are then run into the top of the J piler. As soon as this large tube becomes full, the goods are run out from the other end of the J, at the same speed at which they are being run in at the top, thus keeping the piler full all of the time.

It takes about half an hour for a piece of cloth to go through a piler. As it is necessary for the chemic to remain in the cloth for some time, it is run through for of these pilers. It is then washed again, dipped into a 2 deg. acid solution and run through two more pilers. It then receives the final washing and is ready to be finished.

Other Forms of Bleaching

Bleaching with Peroxide of Hydrogen.—Excellent whites may be obtained by bleaching with peroxide of hydrogen in place of bleaching powder. The cost is, however, practically prohibitive.

Bleaching with Sodium Peroxide.—The bleaching solution is made up of sulphuric acid, sodium peroxide, silicate of soda and water. Cloth may be bleached with this solution in two ways: (a) By steeping it in the bleaching solution; (b) in a kier with circulation by means of a centrifugal pump. The time required to complete the bleach is about six hours; peroxide bleached goods have a creamy yellow shade. By experiment it has been found that the cost of peroxide bleach is very nearly the same as that of the regular chlorine bleach.

Bleaching with Sodium Perborate.—The goods are first boiled with caustic soda in a high-pressure kier, and afterwards in an open kier which has been well lime washed with about 1 per cent of sodium perborate. Sodium perborate is a very powerful bleaching agent.

There are certain tests which may be applied to bleached cotton to determine the quality of the bleach.

Determining Quality of the Bleach

1. The tensile strength of the goods before and after the bleach. By tensile strength is meant the resistance which it offers to being pulled apart. It is measured by

the number of pounds required to tear apart a body having a cross-section area of one square inch. In a properly conducted bleach, there should be very little loss of tensile strength.

2. The percentage of fatty matter should be estimated. This is done by extraction with ether in a Soxhlet apparatus. Gray goods usually contain from 0.86 per cent to 1 per cent fatty matter. After they have been bleached the percentage varies from 0.11 per cent to 0.78 per cent. This variation depends upon the bleaching process used. Peroxide bleach leaves the highest percentage of fatty matter. However, if the goods have had one caustic boil before the peroxide bleach, the fatty matter is reduced to about 0.59 per cent.

3. Raw cotton contains as much as 1.65 per cent ash. After it is bleached the ash should not exceed 0.1 per cent.

4. The presence of oxycellulose interferes with the dyeing of level shades so it is necessary to find out whether or not it is present. A piece of the cotton is dipped into a solution of a basic dyestuff. If there is oxycellulose present, it will take up the color while the cellulose will not.

5. Sometimes cloth which has been stored for some time will turn yellow. This may be due to improper washing in the bleaching process or to Prussian blue which is sometimes used for bluing the cloth. If a sample is exposed to fifteen pounds of steam pressure for one hour, and does not turn yellow, it has been found that the cloth will not turn yellow on being stored.—"Canadian Dyer and Color User."

Observations on Textile Efficiencies

Efficient Production of Steam—Room for Improvement—Feed Waters and Dry Steam—Radiation Losses—Treatment of Trade Effluent—Fiber Recovery—Recovery of Oil and Grease—A New Method—Treatment of Waste and Refuse

By E. V. CHAMBERS

From a Paper Read Before the Midlands Section of the Society of Dyers and Colourists, and Printed in the "Journal" of the Society

IN a textile factory, apart from the selection, purchase, blending, carding, spinning and weaving of the fiber —purely textile operations—there are many other factory services, as, for instance, steam raising, power and lighting, dyeing, scouring and milling, water supplies, effluent disposal, lubrication, engineering renewals and repairs. Of these processes one of the most important is the production of steam, and boiler plant and steam services often fall short of a reasonable measure of efficiency. In many cases defects and their remedies are obvious, and it is the business of the textile manufacturer to see that those whom he engages as engineers should have the necessary fundamental knowledge to carry out their work intelligently and successfully. In all textile areas there are technical colleges equipped for giving the necessary training, and special courses for textile factory engineers should be provided, as they are for design, weaving and dyeing.

Improving Boiler Efficiencies

At the present time boiler efficiencies vary between 40 per cent and 85 per cent, the low efficiencies being generally due to imperfect boiler firing, badly arranged flues, absence of suitable economizers, defects in boiler setting, unsuitable feed water, and obsolete plant. A thorough and complete boiler efficiency test will bring into prominence the defects in the system and many times such tests have led to the saving of 20 per cent of fuel.

Apart from the complete boiler test, there are certain methods whereby at any time the engineer in charge can ascertain the working efficiency of his plant. Such methods involve (1) the judicious use of a water meter; (2) a careful system of checking the coal burned; (3) means for ascertaining and controlling the draught; (4) the prevention of scale in economizers and boiler; (5) absence of air leakages into the boiler setting and flues; (6) careful firing and clinkering; (7) a CO_2 recorder; (8) means of ascertaining the temperature of the chimney gases.

A water meter is sufficiently accurate for everyday working, and if periodically the water consumption is ascertained and checked against the quantity of coal burned, an approximate indication of the evaporative efficiency can be obtained. By observation the most suitable draught for efficient working may be determined, such determination being assisted by a knowledge of the amount of CO_2 in the chimney gases.

Feed Waters and Dry Steam

A suitable feed water, one which does not form scale in the economizer or boiler, has a minimizing effect on the coal consumption, but this effect is not so great as

purveyors of water softening plants would have us believe.

The steam which leaves the boiler should be as free as possible from water. Too much importance cannot be attached to the necessity of dry steam, as steam accompanied by water which has foamed from the boiler, or which has been carried over mechanically, is impure, and is liable to cause trouble either at the engine or in the dyehouse or scouring and finishing departments. When a mineral lubricating oil has added to it a small percentage of fatty acid, lubrication is rendered more effective, as the fatty acid lowers the interfacial tension of the lubricant between the piston and cylinder, but this fatty acid readily combines with calcium and magnesium carbonates to form puttylike soaps, which tend to promote considerable friction in the cylinder. Alkaline boiler water may also affect the metallic packings and metal seatings of the stop valves.

In the steaming of pieces stains and uneven patches are frequently traceable to impurities carried by the steam, and where such difficulties are experienced the installation of a water separator of ample capacity will probably eliminate the trouble.

Radiation Losses

With regard to radiation losses, the main steam pipes are almost invariably protected against condensation losses, but pipes of smaller diameter are often quite uncovered. In a steam range each one-foot length of uncovered one-inch diameter steam pipe may lose by condensation heat equivalent to two pounds of coal per week. There are many factories where 500 feet of such piping, or its equivalent, may be observed, thus causing a weekly loss of 1,000 pounds of coal, equal to twenty-two tons of coal per annum. A suitable pipe covering would almost entirely prevent this loss, and would amply repay its initial cost.

Much steam is frequently wasted by the installation of small steam-driven units such as pumps, small engines, and air compressors. Wherever possible such units should be driven from the power shaft. Small units often require forty to fifty pounds of steam per horsepower, while the main driving engine may develop one horse-power from twelve to fifteen pounds of steam. When due allowance is made for empty friction load there is still a heavy margin in favor of belt driving from the power shaft.

By attention to such points as these the coal consumption in a certain works was recently reduced by 25 per cent and three boilers were able to do the work for which previously four had been necessary.

With regard to the conservation of heat in the dyehouse, the spent dye baths are usually discharged at boiling point, and the speaker has frequently considered the possibility of retaining a portion of this heat in clean water to be subsequently used for dyeing purposes. To heat to boiling point a dye bath containing one thousand gallons requires one hundred pounds of coal. If ten such dye baths are discharged per day, and half the total heat could be retained, a saving of five hundred pounds of coal per day would be effected, or approximately seventy tons per annum.

Treatment of Trade Effluent

In textile districts the liquid waste products consist chiefly of dye liquors, waste scouring liquors, and various wash waters from scouring, milling and dyeing. There are smaller quantities of other liquids, as, for instance, boiler "blow-off" water and waste from water softening plants. The materials recoverable from a textile effluent are (1) fiber, (2) oil and grease, (3) fertilizer, (4) water, (5) soap and scouring materials.

Fiber Recovery

The figures in regard to fiber recovery from waste effluents would be incredible had they not been obtained from actual working results. Partly by estimation and partly by actual weighings it has been computed that 100 screen installations have recovered annually one and a half million pounds of dry clean wool fiber, ranging in value up to four shillings per pound. In some cases 1 per cent of the raw material has been recovered in clean condition from the waste effluent. There are cases where the value of the fiber recovered has paid a fair return on the cost of a purification plant, but such a result is not possible in all cases. Screening is therefore an important factor in effluent purification. Apart from the value of the fiber it should be observed that when removed from the effluent the difficulties of pumping and the stoppages of tanks, drains and water courses are eliminated.

Recovery of Oil and Grease

The methods of oil recovery from waste scouring liquors are too well known to require description. Briefly, the richer portion of the scouring liquor gravitates or is pumped into wooden tanks, and is then treated with a slight excess of sulphuric acid, which sets free both the emulsified and saponified grease. The acid liquor is decanted from the tanks, and the grease is collected upon filters, being subsequently packed in canvas and hot-pressed in the oven press. In normal times this process will give a fair return on the capital cost of the plant.

Filter presses are now gradually replacing the older hand-screw press, and many of the existing grease recovery plants could be considerably improved by due attention to ordinary engineering details. There is considerable waste of steam in many plants owing to bad steam pipes. The mixing of the treated liquor is also in some cases quite ineffective, and increased production of oil has been obtained by the installation of a satisfactory agitating system to bring into intimate contact the acid and the scouring liquor.

Filter presses may be used instead of the oven press, and the horizontal filter press has the advantages that no magma filters are required and that the labor involved in digging the magma from the filter beds and wrapping in canvas packages is eliminated, the magma passing direct from the tanks into the filter press, its flow through the pipes being promoted either by a pump or by a steam ram.

It has been stated that the filter press does not recover nearly as much oil from the magma as the oven press, but this is not supported by an analysis. The average results of a large number of analyses of oven-press cake show an oil content of 22 per cent, and filter-press cake 20 per cent; and considerably more labor is necessary in the case of the oven-press cake.

It is quite possible that before long it will become the general practice to extract the press cake by a solvent extraction process. By this method almost the whole of the oil contained in the cake may be recovered, while the residual cake, being freed from oil, is available as a valuable fertilizer. Such extracted cake contains from 5 to 6 per cent of nitrogen, and is in considerable demand for agricultural requirements. One ton of average press cake can be converted by the extraction process into products having a current value of £6 per ton, while the working charges need not exceed £1 per ton.

New Process of Grease Recovery

A new process of grease recovery is entirely mechanical, and removes the free or emulsified wool grease without affecting the soap or other scouring material contained in the liquor. As a consequence, after having removed from the scouring liquor the free grease and dirt, the liquor may be returned to the scouring bowl in suitable condition for scouring a further quantity of raw wool without the further addition of scouring materials. It has been found in practice that the original scouring liquor, by this method, can be used three times in the scouring bowl.

The process is carried out in an apparatus similar to an ordinary hydro-extractor, with the exception that instead of the usual perforated revolving basket there is substituted a basket with solid walls. The scouring liquor is fed continuously into the rapidly revolving centrifugal machine, and separates into three distinct layers on the sides of the revolving basket, namely, an outer layer of sand and dirt, an intermediate layer of soap solution, and an inner layer of clear wool grease. By means of specially arranged baffle rings the soap solution is continuously discharged from the machine, the grease is removed by a skimming device, and the sand and dirt are removed at intervals. The wool grease obtained by this process always commands a higher price than acid-process wool grease. It is lighter in color, practically free from odor, and very slow in its content of free fatty acid, of which as a rule it contains not more than 2.5 per cent. By this method of working it is possible at a moderate cost to recover the potash originally contained in the raw wool. When the potash is not being recovered, the liquor, after having been useed three times and after its final treatment in the centrifugal machine, is despatched to the ordinary acid-treatment plant, where the grease is recovered which exists as soap in the scouring liquor. This particular grease has a higher saponifiable value than the wool fat which has already been removed, and as a consequence the oil recovered at the acid plant has a higher saponifiable value.

Treatment of Waste and Refuse

The waste products of a factory are numerous and various. There is scrap leather of various descriptions, sweeping from the factory floors, which largely consist of organic and fibrous matter. Canvas and jute also represent a considerable portion of this waste. Rubber tires from transport wagons and the like might also be included. There are also the wipers or waste used for cleaning purposes, which in many cases contain grease or oil to the extent of 40 per cent of their weight. There are also many surplus stores which have been on hand in a works for years which might almost be classified as waste. While these materials under decentralized conditions may be somewhat difficult to dispose of, a centralized establishment for receiving the various waste products of textile installations could handle the same in a very profitable manner.

Such a salvage works would be able to work up the product in the most satisfactory manner. It would be quite possible, for instance, to work up scrap leather satisfactorily for the production of oil and char or animal charcoal. Cleaning cloths and engineering waste pay handsomely when the oil is recovered, which is usually done by means of a solvent extraction process, and the cleansed waste can be reused. In regard to surplus stores and stocks, a central establishment could readily dispose of them. The sweepings from factories would unquestionably sell as fertilizer if extracted in a solvent extraction plant, useful oil being recovered.

Generally speaking, in regard to the treatment of waste, there can be no question that if textile manufacturers were to arrange for a central plant or works they would be able to work up their products in a much more scientific manner than is being done to-day.

Announcement has been made by the Royal Piece Dye Works, silk dyers and finishers, of Paterson, N. J., to the effect that this concern has moved its New York office from 1 Madison Avenue to 297 Fourth Avenue, that city.

With a capital of $500,000, the American International Silk Corporation has been incorporated to manufacture, sell and deal in and with raw and manufactured silk. The incorporators consist of Cornelius A. Cole, Robert A. Van Voorhis and Arthur Oakley.

Blue Dyes Used for Tinting White Goods in Laundries

Ultramarine—Smalt—Insoluble Prussian Blue—Soluble Prussian Blue—Aniline Blues

As Given by the "Manual of Standard Practice," Published by the Laundryowners' National Association

THE reason for the use of a bluing bath in the laundering of starched white goods is so obvious that a thorough discussion of the theory involved is uncalled for. The object to be attained in the use of insoluble blue is to mask any slight yellowish color by adding a little blue, so that the resulting reflection will give the sensation of white light. In the use of soluble blues or dyes, however, the theory is somewhat more involved and a blue which is opaque to green light, that is a blue which has more of a violet cast, must be chosen in order that the reflected light will exhibit an appearance of white. It has been found, however, that in a number of representative laundries, the practice has prevailed, for a long period of time, of not bluing flat work at all, excepting table linen, and the results have been very satisfactory.

The blues which might be used for laundry purposes may be divided into two general classes, as suggested above; i. e., those which are insoluble in water and those which are soluble in water.

The value of the insoluble materials depends upon the fineness and lightness of the individual particles, by virtue of which properties they may be made into a suspension in water, just as silt is suspended, not dissolved, in muddy water. If these materials are not very finely powdered or if they are excessively heavy, they will not remain evenly distributed in the water and hence would not blue evenly.

Ultramarine

The most important blue in this class is ultramarine. It is manufactured by fusing a proper mixture of china clay, soda ash and sulphur, the sinter of which is then ground to an impalpable powder. The naturally occurring pigment of the same chemical composition is known as Lapis Lazuli. Ultramarine is fast to light and alkali, but is readily decomposed by relatively weak acid solutions. It is, therefore, unsuited for bluing in a sour bath, but a good quality of ultramarine is a very suitable non-sour blue. The qualities that make it a good pigment; that is, covering power, render it a good laundry blue. It is very commonly used in the home laundry.

Ultramarine is comparatively cheap in cost, and can generally be obtained from representative paint manufacturers. To obtain good results in using ultramarine, certain precaution must be observed. The bluing should not be done as heavily as is commonly done in using other blue. Do not overblue and try to rinse to color. The stock bluing should be prepared by placing three pounds of ultramarine in a bag made of double thickness of Canton flannel and tying the bag securely. The cloth bag with the ultramarine in it should be suspended in a clean barrel and cold water run in until the barrel is nearly full. The bag should be agitated through the water until the color is of suitable depth. The depth of color of the stock bluing should be so adjusted that about one gallon of it will be sufficient for a standard load of flat work. The ultramarine in one filling of the bag will be sufficient to make up several barrels of bluing water. More detailed directions cannot be given here, but will of necessity have to be left to the judgment of the man in charge of the washroom. It is important, however, not to drain off the bluing bath, but pull the load out of the water. If the bluing bath is drained cloudy work is apt to result. There is also a point of economy in such procedure since this bluing water can be used in the first bath for the next load.

Smalt

Another material which has been employed for a laundry blue is smalt, or, as it is sometimes called, "cobalt blue." It is a glass highly colored with cobalt, and ground to an impalpable powder. Because of its high specific gravity, finer grinding is necessary for it than is required to give an equally good suspension of ultramarine in water.

Insoluble Prussian Blue

Insoluble Prussian blue, or "Turnbull's blue," is not recommended for laundry purposes unless oxalic acid is to be had. In dilute solutions of oxalic acid, Turnbull's blue is soluble and may be used for a sour or non-sour blue, provided careful rinsing precedes the bluing bath in case the souring is omitted. In the trade, the term "Prussion blue" is applied to a number of compounds characterized by the presence of iron and cyanogen and, of course, their blue color, but differing chemically in some particulars, which we will not dwell upon here.

Soluble Prussian Blue

Among the soluble laundry blues available are the soluble Prussian blues and the numerous aniline blues.

Of ten representative samples of bluing examined early in the work, only aniline dyes were found. Recently several samples of the Prussian blues have been submitted. An objection to the use of any Prussian blue in laundry work has been mentioned in the literature. The objection as stated was that on rewashing goods that had been blued with Prussian blue there resulted an iron stain. It would seem that such a result might be looked for since Prussian blue, which is a compound of iron and cyanogen, is readily decomposed by an excessively strong soda solution, with iron oxide resulting.

We are inclined to think, however, that this is a prejudice established when caustic soda was more generally employed than now. In a series of tests in the laboratory plan we were unable to detect any bad effect in rewashing goods blued with this material even when using ten times the concentration of soda ash usually employed. Soluble Prussian blue may be successfully employed for laundry purposes, provided the use of caustic soda is avoided in subsequent laundering of the goods so treated.

Aniline Blues

Aniline blues are derived from coal-tar products. The coal-tar dyes, or aniline blues, are, or have been, most commonly used, and are, at pre-war prices, unquestionably the most suitable. For one reason this is true, because the exact tint of the blue desired, being largely a matter of taste, varies considerably. To meet this, there can be purchased two dyes, one a decided blue, or greenish blue, and another of a nearly violet color, and by mixing the two in suitable proportions, there can be produced any cast of color from a greenish blue to a purplish blue.

This procedure also offers a means of adapting aniline blue to the use of different sours. Basic aniline blues which represent the blues used in or following a sour bath exhibit different tints with different strength acid solutions.

In this connection it is appropriate to state that the term "mordant" as applied to sour for blue is a misnomer. The blues that are suitable for laundry purposes are not fast to the process of washing. In fact, it is very desirable that any bluing be washed out of a fabric with soap and water in the course of subsequent laundering.

The color of some of the acid types of dyes is not altered by sours or sodas, and hence dyes of this type can be used as "non-sour" blues.

Also, aniline blues have a much greater coloring power than any of the other materials that are offered for laundry bluing. For instance, one ounce of a sample of ultramarine in a given volume of water gave a depth of color on a given weight of cotton cloth equal to that given by one-fourth ounce of soluble Prussian Blue and one thirty-sixth ounce of a certain sample of aniline blue. Of course, the tints are different in each case, which makes difficult the matching of the depths of color, but in comparing colors of similar tints the matching can be done with some degree of precision.

It would appear, then, that bluings could be evaluated very satisfactorily by actually comparing one with another in the laundry. This can perhaps be done more satisfactorily in the laboratory since in the laboratory smaller samples can be used with a greater degree of accuracy. Then, too, various samples of cotton cloth will take up different depths of color from the same solution. Goods that are old or that have been overbleached will take up more color for a given solution that will new goods. It is desirable then that the bluing test should be done on as nearly the same quality and quantity of cloth as may be. These conditions are more exactly controlled in the laboratory. In addition to this, the general classification of the bluing can be made in the laboratory, adulterants detected, and properties noted that will assist in the evaluation.

The following requirements should be set in the selection of a bluing for laundry practice:

1. The strength (bluing power) should be commensurate with cost.

2. The shade of bluing should favor the faintly violet blue rather than the green end of the spectrum.

3. The color should be bright.

4. The color should be readily and completely soluble in hot water, or hot water and acetic acid; and should not settle out of solution on standing for several days.

There are few blues that will completely wash out of the fabric with soap and water. It is, therefore, absolutely essential that the bluing be completely bleached out of the goods in the course of a subsequent washing. Many of the laundry blues examined left either a dull gray or a yellowish residue of color after washing and bleaching.

The washing and bleaching test was applied by bluing two square feet of muslin to a shade about ten times as heavy as that ordinarily applied in laundry bluing. The object in making a heavy bluing was to get the cumulative effect of the bluing in the sourse of successive trips of the goods to the laundry. During the course of washing and bleaching, the fabric should be rendered as white as a blank, unblued piece of fabric, which has been washed and bleached under the same conditions.

Because of the difficulty attached to the process of completely washing and bleaching out of bluing without leaving a yellow or gray residue, all bluings should necessarily be made as light as good taste will allow.

MERCERIZATION AND THE ACTION OF CHLORINATED ALKALIS ON COTTON

(*Continued from page* 114.)

paste, and then dyeing in a bath containing a direct color. If the color be a blue the result will be a light blue ground and a darker blue figure, and similarly with other colors. This effect is due to the increased affinity for dyestuffs of that portion of the cotton fabric that has been acted upon by caustic soda. A

similar effect is produced when the cloth produced by the first application described is dyed.

Cause of the Luster of Mercerized Cotton

The cause of the luster in mercerized cotton has been explained in various ways, but the explanation accepted by most textile chemists is that it is directly due to changes in the fiber of a physical rather than a chemical nature; but, on the other hand, such physical changes are brought about largely through a modification of the cellulose through the chemical action of the caustic soda. Whenever a smooth curved surface is present, a high degree of reflected light is produced which takes the form of a bright line of light. A parallel series of such curved surfaces, as for instance a large number of small glass rods arranged parallel to each other, will produce a high display of light through reflection which, owing to local variations, gives the impression of a satin-like luster. This same effect is often noticed with ribbed glass.

The mercerizing process converts the flat twisted fibers into a decidedly cylindrical condition, with an increase in transparency. During the process of carding and combing the fibers are placed more or less parallel to each other, and then if the spinning process is carried out with the view of still further emphasizing this parallel condition a high surface luster yarn will result. In practice the mercerizing process is not carried out until the yarn is spun or woven into cloth.

Chemistry of Mercerization

As to the chemistry of mercerization, the accepted theory at the present time is similar to that proposed by Mercer; that is, that the change is due to the formation of a hydrate of cellulose. When cotton is mercerized, a reaction represented by the following equation takes place:

$$2C_6H_{10}O_5 + 2NaOH = C_{12}O_{20}O_{10}.Na_2O + H_2O$$

and when mercerized cotton is washed the sodium compound is converted into a cellulose hydrate:

$$C_{12}H_{20}O_{10}.Na_2O + 2H_2O = (C_6H_{10}O_5)_2H_2O + 2NaOH$$

The chemistry of the subject has not been studied as thoroughly as the physical side, and the above is merely the accepted theory at the present time.

Other Mercerizing Agents

Other reagents, such as sulphuric acid and a concentrated solution of zinc chloride, if properly used, produce an effect similar to caustic soda, but they have never been introduced on a practical scale for the production of luster.

Various Tests Which May Be Applied to Mercerized Cotton

It is sometimes desirable to differentiate between mercerized cotton and unmercerized cotton, silk and artificial silk, and also to determine the degree of mercerization.

The microscope is of value for this purpose, also certain chemical tests.

Cold concentrated hydrochloric acid will completely dissolve silk in a few minutes, and in the same length of time has no appreciable action on mercerized cotton. Mercerized cotton has a much greater affinity for dyes than unmercerized. The burning test also aids in distinguishing mercerized cotton from silk. With a knowledge of the comparative properties of mercerized cotton and artificial silk, one usually finds but little difficulty in distinguishing between the two.

According to Hubner (Jour. Soc. Chem. Ind., 1908, pp. 105-110), aluminum chloride solution containing iodine will after an hour's reaction give a chocolate-brown coloration with mercerized cotton and no coloration at all with unmercerized cotton.

The same authority describes the use of a solution of zinc chloride, iodine and potassium iodide for distinguishing between mercerized and unmercerized cotton, and also for determining the strength of the caustic soda solution which has been used in the mercerization.

Higgins (Jour. Soc. Chem. Ind., 1908, p. 112) has shown mercerized cotton to be more hygroscopic than unmercerized, and a comparative determination of the hygroscopic moisture may even be used to determine the degree of mercerization. A difference of 3 per cent in hygroscopic moisture may be found between unmercerized and highly mercerized cotton.

DYEING CUTCH ON COTTON

The proper method for dyeing cutch on cotton is to have the cloth well boiled out or de-sized by any of the approved methods that are current to-day. These methods are either kier boiling, wetting out with soluble oil—a method very effective for many classes of goods—or by means of malt. This latter process is gaining in extent of use, and leaves nothing to be desired so far as cleanliness of the goods is concerned, as it leaves the cloth in a condition favorable for dyeing. Cutch is dyed by preparing the bath with dissolved cutch extract and adding to the bath a small quantity of bluestone, the usual amount being about 10 per cent of the weight of the cutch known to be required for the given shade. In this case, for 100 pounds of cloth, requiring twelve pounds of cutch, add 1¼ pounds of bluestone, and then give the cloth whatever number of ends are necessary for the shade. After the shade has been obtained, transfer the rolls to a second jig prepared with a solution of two pounds of bichromate of soda and give several ends while the bath is at the boil. This boiling appears to be necessary for the proper fixation of the color.

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Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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THE 1921 DYE CENSUS

THE REPORTER again takes no little pleasure in chronicling the appearance of the United States Tariff Commission's census of dyes and coal-tar chemicals, the 1921 edition of which has just been issued; and once more seizes the opportunity to thank, in behalf of the trade, the Commission for the thorough and capable manner in which it periodically performs this very real service, both to the Government and to the industry.

And, as usual, some of the facts disclosed by this report are worth noting carefully, for they provide an official confirmation of much already known as well as an indication of much that may be expected.

It is worth noting, for instance, that the title of this year's report reads, "Census of Dyes and Other Synthetic Organic Chemicals for the Calendar Year 1921," and that there is included in it for the first time a census of synthetic organic chemicals other than those derived from coal tar. This extension of the scope of the report should prove welcome in many quarters, and it provides additional proof that the Commission is becoming more and more of an absolute necessity in the conduct of tariff matters by the powers that be in Washington.

Looking further, the report shows a largely reduced output of dyes in 1921, and its compilers hold that this relatively limited production provides a truer index of our domestic dyestuff requirements than has been obtained before, for the very high output of the previous year was coincident with a considerable export trade. It is quite certain that the limited 1921 output may be accounted for by (1) the loss of most of our export trade, (2) the large stocks carried over from the previous year, and (3) the general business depression, of which both manufacturers and consumers of dyestuffs need no reminder.

Worth noting also is the fact that the progress made during the year covered by the report includes the production in the United States for the first time of a number of dyes of greater complexity and more specialized application than was ever the case before. And although many of these dyes are of secondary importance from the point of view of quantity consumed, they are essential in the dyeing and printing of numerous fabrics. Their addition to our list of colors represents a distinct step toward a well-rounded coal-tar chemical industry, for their successful production represents, in many cases, technical achievements of a high order.

The report shows that there were 201 firms engaged in the manufacture of coal-tar derivatives in 1921. The output of dyes by 74 firms exceeded 39,000,000 pounds, a decrease of 56 per cent from that of 1920. The sales during 1921 exceeded 47,000,000 pounds, valued at more than $39,000,000. The sales exceeded production by 22 per cent, indicating that a part of the domestic consumption for that year was supplied from the large stocks carried over from the previous year's abnormally high production. The sales of dyes for 1921 exceeded the imports of 1914, when the United States imported nearly 46,000,000 pounds and produced over 6,000,000 pounds of dyes from imported German intermediates.

It is encouraging to note that conspicuous progress was made in the evolution of other finished products derived from coal tar, and that this has been particularly true in the field of synthetic medicinals, many of which are essential to public welfare, and for the furnishing of which our Government has no moral right to depends upon alien sources of supply. Of other finished products derived from coal tar, the production of perfumes showed an increase comparable to that of the previous year, while the output of photographic chemicals, color lakes, synthetic phenolic resins and synthetic tanning materials showed reductions in 1921. Whether or not the reduced figures with respect to photographic chemicals are the result of increased foreign competition does not become at once apparent; but certain it is that the influx of German chemicals was never greater since the war than at the present time, and it is a well-known fact that many dealers invariably "push" the foreign products ahead of the domestic—no matter how excellent the quality of the latter may be—solely because they pay a higher profit. For this one can scarcely blame the dealers, but it will readily be seen that it is not a condition calculated to foster advancement in American ability in this important field of endeavor.

The attention of Senator King and his New Hampshire friend, Senator Moses, should by all means be called to the fact that the average price of all dyes in 1921 was 83 cents per pound, as compared with a value of $1.08 per pound in 1920 and a value of $1.26 per pound in 1917. The tendency has been to reduce both

the cost of production and the sales price of American dyes; and since nothing else seems to avail, perhaps these Government statistics may serve to furnish our trust-destroying zealots with a little much-needed education. Nor should it be omitted to mention that in comparing the prices of these different years, the development of dyes each year of greater value and complexity has tended to increase the average value per pound of all dyes produced—or, in other words, some of these newer products might well be considered an excellent "buy" even at the old scale of prices. If this is an example of what the American dye "monopoly" is doing, then foes of adequate protection are no friends to the dye consumer.

The total quantity of dyes imported in 1921 was 3,914,036 pounds, valued at $5,156,779, or $1.32 per pound, compared with 3,402,582 pounds, valued at $5,763,437, in the previous year. The imports of 1921 represent 10 per cent of the production and about 8 per cent of the total dye sales during the year. Germany supplied about 48 per cent of the total dyes imported during 1921; Switzerland, 41 per cent; England, 7 per cent, and all other countries, 4 per cent.

Exports of domestic dyes for 1921 show a decrease of nearly 79 per cent compared with those for the previous year. The value of our exports for 1921 was $6,270,139, compared with $29,823,591 in 1920. The total exports of dyes for 1921 were less than for the year 1917, when the first considerable expansion of the domestic dye industry from pre-war conditions occurred.

The great reduction in our export trade may be attributed in part to the general business depression, but the chief cause was the appearance of German dyes, with which the domestic producers have been unable to compete, in such world markets as China, India and Japan, and it goes without saying that unless the industry receives for the next few years the proper support here at home it will never be able to develop to a point where it can offer serious competition to the Germans abroad, and thus the benefits of these world markets, so confidently expected to accrue to our dye makers at the time when the industry was just getting under way, will be forever lost.

The report also shows that the total production of synthetic organic chemicals other than those derived from coal tar—that is, those used as medicinals, perfumes, flavoring ingredients, solvents, etc.—was 21,545,186 pounds. These sales amounted to 16,761,096 pounds, valued at $13,746,235.

The development of this industry in the United States has been parallel to that of the dye industries, since our supply of synthetic organic chemicals was in the hands of the Germans prior to the war. That this development is the result of a vigorous attack, coupled with a high order of technical skill for which those entering this field of endeavor are to be complimented, is true; but the fact most important to our legislators is that it is to an even greater extent the result of artificially prolonged war conditions which neither this nor the dye industry is yet able to dispense with.

Those interested who have not yet obtained a copy of the 1921 Census should do so without delay for reasons too obvious to mention, and for their convenience, as well as with a view to securing a prompt reply and the avoidance of needless confusion and delay in Washington, the information is here given that copies may be obtained at a cost of 15 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

THE ENGLISH COLOUR INDEX

WE call attention herewith to the fact that the first monthly part of the heralded "Colour Index" being prepared by the Society of Dyers and Colourists under the direction of F. M. Rowe, D.Sc., F.I.C., assisted by a large revision committee of experts, is now ready, and that orders for this work have been received from color users in all parts of the world.

As before set forth in these columns, we believe that this effort to provide an authentic color index in the English language should receive widespread endorsement and support. The work will be published in twelve monthly parts, and will afterwards be kept up to date through the medium of the "Journal of the Society of Dyers and Colourists." Those who wish to obtain further particulars or order forms may do so by applying to the Secretary of the Society, 30 Pearl Assurance Buildings, Bradford, Yorks, England.

A WARNING WHICH SHOULD BE HEEDED

THAT the recent Government raid on the Chemical Foundation came at an exceedingly bad time for the welfare of the dye section of the pending tariff bill—as enemies of the dye industry no doubt intended it should—was brought out more clearly than ever at a recent meeting of the Synthetic Organic Chemical Manufacturers Association of the United States. That this important organization has lost no time in launching a counter-attack upon the adverse forces which brought about the downfall of the dye section in the Senate is plainly indicated by a unanimously signed petition forwarded to Senator Porter J. McCumber, Chairman of the Senate Finance Committee, which said, in effect: "The American dye and organic chemical industry faces destruction by the German chemical Cartel unless the Senate reconsiders its action in striking out of the tariff bill the protection proposed by the Finance Committee for the American industry. Manufacture of dyes, medicinals and other organic chemicals cannot be maintained in the United States unless this is done."

This meeting, called by Dr. Charles H. Herty, President of the Society, was easily the most important development in the dye controversy since our last issue. It rightly made it plain that the issue of the demanded re-

turn of the Chemical Foundation patents, and the issue of adequate protection for American manufacturers of synthetic organic chemicals, are separate and distinct. It indicated that these manufacturers—again rightfully—do not propose supinely to accept as final the fantastic political vagaries and vote-swapping orgies of our Solons. Once again the dye question has been transformed from a clear-cut, isolated issue to a mere factor in factional disagreements. If Congress elects to go directly against the specific recommendation of the Senate Finance Committee, it will have to furnish the public with a more acceptable reason than that the necessary votes could not be bargained for. Says the petition:

"At a meeting of the Synthetic Organic Chemical Manufacturers Association of the United States, held at New York, August 4, 1922, the undersigned manufacturers of dyes, drugs and other organic chemicals, gave consideration to the serious danger that threatens their industry by reason of the defeat of the Dye and Chemical Control Act in the Senate, July 15. They now respectfully petition the Finance Committee to take such action as may be appropriate to reinstate the clauses in the Tariff Act stricken out by the Senate's action. They repeat what they have heretofore testified to before your Committee, that nothing less than the provisions of the Dye and Chemical Control Act will adequately protect their industry; that no specific or ad valorem rates will prevent the German Cartel from regaining absolute control of the American organic chemical market; and that the manufacture of dyes, medicinals and other organic chemicals can no longer be maintained in this country without the legislative protection heretofore advocated by your Committee after thorough investigation of all the facts."

It was Dr. Herty who forcefully called attention to the effect of the recent Government patent order upon the action of the Senate. Dr. Herty said:

"There is no question that the American industry today faces a grave danger. It is my belief that the recent vote in the Senate, sitting as a committee of the whole, was due to a confusion of thought in the minds of several Senators between two issues: patents and protection for this industry. This confusion arises, I believe, from the recent action of the Government in connection with the Chemical Foundation. Logically this has no connection with the consideration of the question of adequate protection for this vitally important American industry. The nation must depend upon this industry for much that is absolutely essential to the continued freedom of scores of our industries from foreign domination for medicinals and medical science, scientific and industrial research, and for essential weapons of national defense if ever again there is another war, which God forbid.

"I sincerely hope that the confusion of thought which existed at the time the vote was taken in the Senate striking out the provisions placed in the bill by the Senate Finance Committee, will be cleared away, and that these paragraphs will be reinserted in the measure before it is passed.

"Unless this is done I foresee the ruin of the American industry by the great German chemical Cartel, with its fifty years of experience, and its vast resources, which has been so strenuously fighting us through its agents in this country."

This is no idle warning, nor is it the outburst of an alarmist. Dr. Herty's words should be heeded by all elements of the chemical industry in the United States. Through the Society for which he speaks, the industry is well organized to combat the anti-American tendencies—to use a polite word—which threaten to rob it and the country at large of needed legislation. But even the Society cannot perform its functions with maximum efficiency unless its hands are upheld by the active co-operation and support of every last individual, both great and humble, which the industry numbers among its ranks.

Foreign Trade Opportunities

Reserved information may be obtained from the U. S. Bureau of Foreign and Domestic Commerce and its district and co-operative offices by duly registered firms and individuals upon written request by opportunity number. The Bureau does not furnish credit ratings or assume responsibility as to the standing of foreign inquirers; the usual precautions should be taken in all cases, and where no references are offered it does not necessarily imply that satisfactory references could not be given. Correspondence may be in English unless otherwise stated. Symbols: *Reported by American consular officers; †Reported by commercial attaches and trade commissioners; ‡Direct inquiries received by the Bureau.

2456.*—A manufacturing firm in Italy desires to secure an agency for dyes, colors and varnishes. Correspondence should be in Italian, French or German. References.

2987.*—An agency is desired by a merchant in Norway for the sale of cotton underwear, hosiery and textiles. Quotations, f. o. b. New York or c. i. f. Norwegian port. Payment to be made through banks in Norway and New York. Reference.

2988.†—A commercial agent from Manchuria is in the United States and wishes to secure an agency for the sale of hosiery, overalls and other clothing for workmen, and shoes. References.

2508.*—An agency is desired by a merchant in Italy for the sale of chemical products. References.

2500.‡—An importer in Belgium wishes to secure

the representation of firms for the sale of cotton waste. Reference.

2472.‡—A firm in Italy desires to secure the agency on commission for the sale of chemicals and raw materials for industries such as the manufacture of candles, soaps, matches, paper, textiles, rubber, varnishes, and tanning of leather. References.

2466.†—A business man from Denmark is in the United States for the purpose of securing the representation of manufacturers for the sale in Denmark, Norway and Sweden of hosiery, lingerie, haberdashery and any other goods which would find a ready sale in those countries. References.

2912.*—The purchase is desired by a merchant in Chile of toys, novelties, fancy goods, and silks and woolens for women. Quotations, c. i. f. Chilean port. Correspondence, Spanish. References.

2914.*—A manufacturing firm in Sweden wishes to purchase cotton yarn, buttons, ribbons, notions and small wares. Quotations desired c. i. f. Goteborg.

2951.‡—A commission merchant in Cuba desires to secure an agency for the sale of cotton and silk hosiery on a commission basis. No reference given.

2884.*—A firm of importers in Germany wishes to purchase and secure an agency for the sale of raw materials, such as cotton, copper, grain, foodstuffs, lard, packers' products, canned goods, dried fruits, condensed milk, etc. Quotations, c. i. f. German port. References.

2933.*—A merchant in Costa Rica desires to secure an agency and purchase cotton goods. Quotations, f. o. b. Boston, New York or New Orleans. References.

2935.*—A commercial agent in Norway desires to secure the representation of manufacturers of denims of all qualities. Quotations, f. o. b. New York and Norwegian port. References.

2306.‡—An importer in France desires to be placed in touch with manufacturers of silk, satins, velvets, cotton goods, hosiery, shirting, underwear, hardware, novelties, jewelry, paints, chemicals and tools. No reference given.

2373.*—A request has been received from Japan that manufacturers forward samples and price lists of thread for knitting stockings of wool, linen, cotton or silk. Quotations should be c. i. f. Keelung. Payment: Cash against documents through banking corporation. Reference.

2299.*—A firm of commission brokers in Italy desires to secure an agency for the sale of cotton textiles (oxford shirting), madampolam, crespo, panama, and silk and woolen textiles. References.

2356.*—A commercial agent in Ecuador wishes to secure the representation of manufacturers for the sale of flour, lard and other foodstuffs, chemicals, hardware, textiles and notions. Quotations should be given c. i. f. Ecuadorean port or f. o. b. steamer at port of shipment. References.

2349.*—A merchant in Greece importing for own account and for account of clients, desires foodstuffs, fancy rice, white granulated sugar, white flour, wheat, coffee, etc., and bleached and unbleached cotton goods, chemicals and drugs. Quotations should be given c. i. f. Piraeus. Payment arranged by confirmed letter of credit in New York. References.

2343.‡—An American firm of manufacturers' representatives having established connections in Mexico, desires to secure an agency for the sale of natural and artificial leather for general use, calendars, canned goods, silks, artificial silks, voiles and cotton goods. References.

2415.†—A request has been received from Australia that manufacturers forward samples and quotations on ten bales of cotton yarn similar to that used in the manufacture of mops.

2429.*—A merchant in France desires to secure an agency for the sale of chemical products and foodstuffs. Correspondence should be in French.

2425.*—A dry goods firm in Venezuela wishes to purchase cotton piece goods. Quotations should be given f. o. b. New York City. Payment to be made on receipt of goods, or against documents in New York. References.

2384.†—An importing firm in Egypt desires to secure an agency for the sale of leathers, especially sole, of medium thickness, patent, box calf, black and brown, glazed kid and chamois, tin in bars, and cotton yarns. Quotations desired c. i. f. Alexandria. Reference.

2385-2405.—Owing to the lack of space a number of "foreign trade opportunities" pertaining to textiles have been grouped and can be obtained by referring to the opportunity numbers given.

2919.*—A manufacturing firm in Chile desires to purchase flour sacking, cotton thread for sewing sacks, and lubricating oil, in very large quantities. Quotations, c. i. f. Chilean port. Correspondence, Spanish or German. References.

The Manufacture and Application of Hydrogen Peroxide

Sodium, Barium and Hydrogen Peroxides—Purity—Uses—Bleaching Textiles—Water Should Be Tested—Concentration—Testing Weak Solutions—Storing—Pink Stains—Preparation for Dyeing—Treatment of Fades

By H. WILSON

(A Paper Read Before the Bradford Branch of the Foremen Dyers' Guild. Copyright of the Guild)

HYDROGEN peroxide is a colorless liquid, a compound of hydrogen and oxygen. It was discovered in 1818 by Thenard, who prepared it by the action of dilute hydrochloric acid on barium peroxide.

There is in existence a number of compounds which easily give off oxygen, and we can class these as persalts. In practice the following products are largely used, all for the sake of oxygen which they contain: Barium, sodium and hydrogen peroxides, their derivatives, sodium perborate, barium percarbonate, zinc and magnesium peroxide, and also the carbamide compounds.

The active oxygen which can be split from these substances has in the moment of being liberated (this is the nascent state) the property of acting as a powerful oxidizing agent, with highly disinfecting properties and strong bleaching actions.

Sodium Peroxide

Sodium peroxide is made by heating metallic sodium to 200 deg. Cent. in a current of air. It is a yellow, highly hygroscopic powder and has a strongly alkaline reaction. It is sent out in well-closed, soldered tins, and if stored carefully will keep well. The chemical formula is Na_2O_2. Sodium peroxide contains about 20 per cent active oxygen. By carefully adding sodium peroxide to a solution containing diluted sulphuric acid hydrogen peroxide is formed, according to the following reaction:

$$Na_2O_2 + H_2SO_4 = H_2O_2 + Na_2SO_4$$

From this formula it is evident that hydrogen peroxide made from sodium peroxide will always contain as impurity some sodium sulphate, which for many purposes will be objectionable.

A further disadvantage of this process is its comparative danger in handling sodium peroxide. It is a very dusty powder, and particles flying about the works will burn holes into any materials waiting to be bleached. In adding the sodium peroxide to the sulphuric acid bath great care must be exercised on account of the heat which is created. This heat in the chemical reaction easily decomposes a certain amount of the newly formed hydrogen peroxide, and considerable quantities are easily lost straight away. The solution also splutters and is apt to burn the skin of the workman and is specially dangerous to the eyes.

Sodium peroxide is used for manufacturing sodium perborate on a large scale.

Barium Peroxide

This is formed by heating barium oxide to dull redness and exposing it to a stream of air. At a very high temperature it loses the second atom of oxygen, being reconverted into the monoxide, and this double reaction is used for the preparation of oxygen on a large scale.

Barium peroxide is used almost exclusively for making hydrogen peroxide. The resulting product is pure, but the manufacture is rather expensive. By adding hydrochloric acid or phosphoric acid and precipitating the barium salts with sulphuric acid, hydrogen peroxide and barium sulphate are formed.

The small additions of hydrochloric acid are continually regenerated and therefore the following equation may be adopted:

$$BaO_2 + H_2SO_4 = H_2O_2 + BaSO_4$$

Hydrogen peroxide can also be obtained from barium percarbonate:

$$BaO_2 + H_2O + CO_2 = H_2O_2 + BaCO_3$$

This method produces very pure hydrogen peroxide and is used mainly for making the medicinal product. As the manufacture is very expensive this method has now been almost entirely superseded by the introduction of the electrolytic process.

Hydrogen Peroxide

In all cases the product which is required is the hydrogen peroxide, and this again is wanted for its active oxygen. By liberating the active oxygen from hydrogen peroxide only water remains behind.

$$H_2O_2 = H_2O + O$$

This simple fact constitutes the great advantage which hydrogen peroxide has over all other bleaching agents. Hydrogen peroxide leaves behind no impurities or chemical residues. It also follows that in order to get the greatest advantage out of the use of hydrogen peroxide this substance should be applied in the purest form possible. In this case the following two points may be observed:

1. The bleached material, after the bleaching process, will contain no particles of chemical which might necessitate extra washing or give rise to stains.

2. The activity of hydrogen peroxide is dependent on its purity. Even minute traces of any heavy metals (like iron or copper) are dangerous, since they at once set up decomposition in the hydrogen peroxide solution and quickly destroy a larger part of the active oxygen. In making hydrogen peroxide it is therefore of the greatest importance to produce a product chemically pure.

We have already mentioned two ways of making hydrogen peroxide. Both give a solution containing about 3 per cent H_2O_2, which is more or less liable to decomposition, owing to the impurities already mentioned.

Pure Peroxide

Great progress has now been made in recent years by introducing a method for producing hydrogen peroxide by an electrochemical process, which results in a hydrogen peroxide being obtained of unequalled purity and also of a concentration hitherto quite unknown. It contains 30 per cent H_2O_2, which is over 100 volumes. The process is a secret. However, we have been informed that the product is made by producing through a high electric current per-compounds of sulphuric acid or its alkaline salts and then obtaining from these compounds, by distillation, the hydrogen peroxide:

$$2KHSO_4 = K_2S_2O_8 + H_2 \text{ (Electrolysis)}$$
$$K_2S_2O_8 + 2H_2O = 2KHSO_4 + H_2O_2 \text{ (Distillation)}$$

This distillation process produces hydrogen peroxide of great purity, very stable and almost non-decomposing.

A further great advantage of this new product is the high concentration, which saves much room in storing. There is only one carboy where otherwise there are eight or ten. This concentrated and pure 30 per cent hydrogen peroxide does not freeze, even in severe cold weather, and saves in freight and carriage.

Further, on account of its purity, it is very stable and keeps its strength almost indefinitely. It has come under my personal observation that one carboy which was left in storage for seven years had gone back from 101.5 volumes to 98, which I think is a very fine testimonial for the quality of the article.

A further advantage of this concentrated quality over the older and weaker solutions is that you can bleach more goods with relatively the same quantity of hydrogen peroxide. Careful tests have shown that this amounts to about 40 per cent. The bleaching baths have always the same successful action. The resulting white is more even, repeated operations, owing to the first bath being out of order, are almost unknown. The high concentration of the 300 per cent hydrogen peroxide allows the bleaching baths to be replenished without increasing their volume.

A simple experiment to show the greater stability of this concentrated hydrogen peroxide can be made by heating the same, say to 90 deg. Cent. This concentrated quality does not even at such a high temperature decompose, whereas the 12-volume commercial quality decomposes very rapidly.

Uses of Hydrogen Peroxide

Hydrogen peroxide is largely used for medicinal purposes, for disinfecting and washing wounds, for disinfecting the mouth and teeth, and compounds with carbamide are used for gargling, sore throats, or internally for stomach ailments (magnesium peroxide), for salves (zinc peroxide), for medicinal baths (oxygen treatment in hospitals and hydros), also as disinfectant generally.

Commercial solutions of hydrogen peroxide are known as 10, 12 or 20 volumes—that is, 1 c.c. yields 10, 12 or 20 c.c. of oxygen when decomposed.

For medicinal purposes the 10 or 20 volume quality is universally used, and in order to satisfy this market we have made experiments with a view of diluting the 100 volume quality in such a way as to give the most satisfactory results. We find an addition of sodium silicate, urea, glucose, strontium hydroxide, magnesium sulphate, all have their advantages under different conditions.

Hydrogen peroxide is now largely used for preserving fish. The fish is bleached white and at the same time is disinfected and made stable. It is also used for preserving meat. Here you have a powerful oxidizing agent and highly efficient antiseptic and at the same time a most inoffensive substance. You disinfect your fish or meat with hydrogen peroxide, then by boiling or cooking it you liberate your oxygen and it leaves you pure water. Hydrogen peroxide can also be used for preserving milk, which will then keep for two days, even in hot weather. It is, of course, essential that only the purest hydrogen peroxide should be used for these purposes, and again we may emphasize the great progress which has been made in introducing to the market this concentrated hydrogen peroxide made by the electro-chemical process.

Bleaching Textiles

I now come to the great field which is open to the use of hydrogen peroxide in the textile trade for bleaching all kinds of material.

Hydrogen peroxide acts as a bleach because the active oxygen bound to the water has a strong oxydizing action on organic compounds. It destroys a large number of impurities contained in textile fibers and which cannot be

removed by washing and scouring. Hydrogen peroxide will bleach cotton, wool, half-wool, silk, half-silk, linen, artificial silk, feathers, straw, wood, bone, horn, ivory, bristles, hair, furs, soap and oils. It is also used in household washing in mixtures sold under various names, but all containing hydrogen peroxide.

All goods before bleaching should be thoroughly cleaned. This will save peroxide and also give the best white. The various goods will have to be treated differently, but a few general rules may be laid down.

All textile fibers are bleached in a slightly alkaline solution. The more alkaline the hydrogen peroxide solution is used the easier it will decompose. It therefore acts as a quicker bleach in the alkaline state. It loses, however, a large amount of the oxygen as gas and is not economical.

Now we have already remarked how important it is to produce hydrogen peroxide of great purity, and this should also be borne in mind in the application of peroxide for bleaching purposes. The cisterns, lading cans and all utensils should be kept scrupulously clean. The goods for bleaching should also be thoroughly cleaned before the bleaching process is begun. Special attention should be paid to the water. Any traces of iron, copper or magnesium, for instance, are injurious.

Test the Water

It is advisable to test the water first by making a weak solution with hydrogen peroxide, and watch if this solution gives off oxygen gas. It will be found that in most cases spring or well or town water is more suitable than condense water, especially if the steam passes through copper pipes or copper valves.

Water is also often spoiled by iron taps or copper taps. It follows that these taps should always be kept carefully clean and should have an elbow which will allow the taps to be turned over the vessel side and left running to waste until clean and clear water flows. This should then be turned into the cistern to prepare the bleaching bath. Any metal parts about the cistern should be well coated with paint and always kept clean. It is also of great importance that no metal should in any shape or form adhere to the goods.

Small pieces of wire or needles left in the pieces cause damage to the goods. Even stains caused by metallic salts, like iron or copper-oxide stains, would by their catalytic action destroy the textile fiber.

The vessels for bleaching purposes are mainly made of wood. Pitch pine or other hardwoods are most suitable. New vessels are often liable to give rise to yellow stains on the goods. It is therefore advisable to boil the vessels out and add some hydrogen peroxide to help to clean the vessel. The coils for heating are mostly made of lead. Lead, unfortunately, has a decomposing action on hydrogen peroxide. However, there seems no better metal for the slightly alkaline bath except tin, which is well adapted for the purpose. The goods which are being bleached must not come into direct contact with the steam coil; this should therefore be coverd by a wooden plank with holes in. The steam pipe, if it passes through the bleaching bath, to the coil, must also be covered with wood and protected from contact with the goods. The temperature of the bleaching bath varies according to the goods to be bleached.

Horn and bone are bleached at a temperature of 35 deg. Cent., wool at 40 to 50 deg. Cent., cotton at 60 to 65 deg. Cent., and straw at 80 deg. Cent. The hotter the temperature the more intensive is the bleaching action, but also the greater the loss in oxygn. By making various additions (such as waterglass or pyrophosphate) the decomposition can be minimized; this is, however, only possible if very pure hydrogen peroxide is used, that is, the 30 per cent quality.

Concentration

The concentration of the bleaching bath varies very considerably according to the goods to be bleached. Wool or cotton are bleached in baths containing 5 grams, straw 20 to 30 grams, and horn 30 grams of 30 per cent peroxide per liter.

For all purposes where hydrogen peroxide is used it is of importance to know and ascertain the exact amount of oxygen contained. The test is so simple that it should be made regularly even by small users. The apparatus required is 1 burette with glass tap and a holder, 1 pipette for 1 c.c. and 10 c.c., and 1 glass beaker and a glass rod for stirring. A solution of permanganate of potash is used, and according to the concentration of the hydrogen peroxide solution to be tested a half-normal or one-tenth normal permanganate solution is used. The half-normal solution is prepared as follows: Dissolve 15.8 grams of permanganate of potash (chemically pure) in one liter of water. For this purpose use a glass bottle, holding one liter liquid, put into this the required amount of permanganate and as much water as will dissolve it by shaking the bottle, then fill up with water to the one liter mark.

This solution in time will deteriorate a little, and it is therefore advisable only to make a solution which will last about two weeks.

In order to test a concentrated quality of hydrogen peroxide take 1 c.c., put into the glass beaker, add a little pure water and some diluted sulphuric acid, and then gradually let the solution of potassium permanganate flow from the burette into this hydrogen peroxide solution, constantly stirring it until a slight pink coloration is obtained. Then read off how many c.c.'s of the permanganate solution have been used. Every c.c. of potassium permanganate is equivalent to 8.5 grams hydrogen peroxide solution. A solution of the 30 per cent quality; that is, 300 grams H_2O_2 per liter must therefore use 35.4 c.c. of the permanganate solution, since 35.4×8.5 equals 300 grams.

If more diluted solutions, say a 3 per cent H_2O_2, have

to be tested, take instead of 1 c.c., say, 10 c.c. of the solution, and then 1 c.c. of the permanganate solution equals 0.85 grams H_2O_2 per liter. If from a 3 per cent H_2O_2 solution 10 c.c. are titrated and 35.4 c.c. permanganate solution are required to obtain the pink test, then 35.4 $\times$ 0.85 equals 30 grams H_2O_2 per liter.

Testing Weak Solution

For testing a still weaker solution of hydrogen peroxide, say, for instance, a bleaching bath, it is advisable to use the one-tenth normal permanganate solution for titrating purposes. Dissolve 3.16 grams permanganate of potash per liter. If 10 c.c. of the H_2O_2 solution is used 1 c.c. permanganate equals 0.17 grams H_2O_2 per liter. A 1 per cent bleaching bath will therefore require 59 c.c. of the one-tenth normal permanganate solution per 10 c.c. H_2O_2 59 $\times$ 0.17 equals 10 grams H_2O_2.

The strength of solutions of hydrogen peroxide may also be estimated by mixing 10 c.c. with an equal amount of concentrated H_2SO_4 (diluted), adding potassium iodide, free from iodate, and estimating the amount of liberated iodine in the usual manner by means of decinormal thiosulphate of soda solution, using starch as indicator.

A regular examination of the hydrogen peroxide bought and used at the works will prove the great advantage of the concentrated 30 per cent H_2O_2 against the weaker solutions of 10 or 12 volumes.

The concentrated quality is very constant and hardly varies in its consistency; whereas the 10 volumes commercial article loses after a few weeks as much as one-half of its value. Very irregular results in the bleaching are the consequence, and lead to much extra labor and annoyance.

It will be found by regularly testing the bleaching bath that the 30 per cent H_2O_2 on heating gives off its oxygen much slower than bleaching baths where the 3 per cent H_2O_2 has been used.

Storing

Some consideration should be given to the storing of hydrogen peroxide. The best place is a cool shed where carboys are not exposed to direct sunlight. In large works where considerable quantities of hydrogen peroxide are used it is advisable to empty the carboys by means of a vacuum pump into stone troughs, and from there again by vacuum pump to the cisterns where the bleaching process is taking place. Here the measures should be kept handy for measuring the exact quantity required. By these means the transport of the full carboys round the works would be avoided, also all contamination with impurities obviated, and a saving of labor effected.

Bleaching cotton with hydrogen peroxide would no doubt rapidly supersede the chloride of lime bleach if its price were to come down sufficiently low. It produces a better white and there is no risk of tendering the fiber. It will, therefore, only become a question of time when this change will take place. As the manufacture of H_2O_2 conc, after the electro-chemical process progresses and larger and ever larger quantities are turned out, there is no reason why it should not in time be manufactured cheap enough to take up a successful competition against chloride of lime or hypochlorite of soda.

As far back as 1889 a communication was made to the Industrial Society at Rouen, by Horace Kochlin, for bleaching cotton pieces a very fine white without in the least tendering the strength of the fiber.

For five pieces of 100 meters each, weighing 50 kilos each, prepare the following bath:

1,000 liters water.
10 kilos caustic soda solid.
30 kilos soap.
8 kilos calcined magnesia.
50 liters hydrogen peroxide 12 volumes.

Boil the goods for six hours, wash, pass through sulphuric acid at 30 deg. Tw., and wash again. The addition of calcined magnesia is recommended to the bath in order to prevent the rapid decomposition of the peroxide. Its action in retarding the evolution of the oxygen is due, according to Prud'homme, to the formation of a hydrated peroxide of magnesium, which decomposes very slowly at the boiling temperature. The magnesium soap which forms during the boiling is not of a sticky nature and is easily removed from the pieces by washing in water.

In some cases it is advisable to bleach the pieces first with chloride of lime, and finish off with hydrogen peroxide. Hydrogen peroxide serves as a further bleach and also acts as an antichlor, thus preventing a tendering of the fiber. This idea should recommend itself not only to piece dyers, but also to the warp and yarn dyers.

All trace of chlorine is eliminated by this aftertreatment, and more level and even dyeing of the material in the subsequent dyeing operations and a stronger material are insured.

Pink Stains

It has been shown that pink stains are avoided by the peroxide bleach:

1. Pink stains may be caused by the oxidation of aniline or by the oxidation of other members of the aromatic group.

2. Pink stains from the oxidation of aniline develop on *neutral* or *slightly acid* goods, and develop more rapidly in a moist atmosphere.

3. White cotton goods should not be allowed to come in contact with aniline fumes or to be stored in proximity to fast black goods.

4. Pink stains have *not* developed *after nine months'* exposure on goods *bleached with peroxide of hydrogen.*

Pink stains are due to traces of chlorine left from

bleaching process, and white cotton goods after treatment with some antichlor should not develop pink stains. Good results should be obtained by treating bleached goods with H_2O_2 and ammonia, the H_2O_2 acting as antichlor.

Hydrogen peroxide is also capable of giving results as a bleaching agent for linen. This fiber is still extensively bleached by grass bleaching, a method in use from the earliest times. It depends largely for its action upon the fact that traces of hydrogen peroxide exist in the atmosphere, and more especially in dew, rain and snow.

Wool bleaching is done in order to remove the natural yellow color of the wool. Two entirely distinct methods are employed. In the older method of stoving, sulphur dioxide acts as a reducing agent upon the yellow coloring matter in the wool and decolorizes the same by reduction. The new method of bleaching with hydrogen peroxide *destroys* the coloring pigment by oxidation, and therefore a permanent white is obtained. In the older reducing method the white obtained is only temporary, and the material becomes gradually yellow again, probably by re-oxidation of the decolorized pigment.

To obtain a good white it is necessary that the goods should be thoroughly scoured and washed and be as clean as possible to start with. The bleaching solution will then be able to thoroughly penetrate the fiber. The usual process is to steep the wool (loose wool, slubbing or yarn) from 12 to 24 hours in a bath containing a dilute solution of H_2O_2, made distinctly, but not strongly, alkaline with ammonia or silicate of soda. The bath contains:

99 gallons of water.
1 gallon H_2O_2 30 per cent.
½ gallon ammonia 0.008 sp. gr.

The amount of liquor used need only be sufficient readily to saturate the material, and at the end of the operation the liquor should be allowed to drain into the bath, which may then be made up to its original strength and used again. After bleaching, the wool or yarn should be squeezed, washed in water, then in acidified water, and finally in water again.

Preparation for Dyeing

The peroxide bleach is not only useful for goods which are to remain white, but also for wool, yarn, or pieces that are to be dyed in pale, delicate shades.

After bleaching with peroxide the wool dyes more readily than before treatment, and differs from wool which has not been treated or which has been bleached by sulphur. Sulphur stoved wool is apt to dye very unevenly, or not at all, on account of the destructive effect of sulphur upon the colors.

The speed at which the bleaching takes place may be increased by:

1. Rinsing the temperature of the bleaching bath.
2. Increasing the alkalinity of the solution.
3. Exposure of the material to light, especially sunlight.

Bleaching half-woolen material consisting of wool and cotton can be carried out with great advantage by using hydrogen peroxide. Both fibers are bleached simultaneously, and no tendering of the cotton fiber takes place.

Treatment of Fades

Experiments have been carried out in connection with the redyeing of faded goods or garments. If these goods are stripped with hydrosulphite very uneven results are often obtained. By treating these stripped garments overnight with a hydrogen peroxide solution perfectly solid results are obtained in the subsequent dyeing; also very much clearer and brighter shades.

A very fine white is obtained on astrachan by the H_2O_2 bleach.

Further experiments have been carried out to illustrate the effect of bleaching on horn buttons. These have been immersed in a cold solution of H_2O_2, afterwards treated with concentrated sugar of lead, and subsequently concentrated hydrochloric acid. A fine white is thus obtained.

Tussah silk can be bleached at a temperature of 60 deg. Cent. with:

30 c.c. peroxide of hydrogen.
3 grams silicate of soda.
Per liter liquor.

Before the bleaching process tussah silk should be degummed for forty minutes at 40 deg. Cent. in a 0.1 per cent solution sodium sulphide, then in a cold solution of 0.3 per cent hydrochloric acid.

The brown tint gives way to a pure yellow. It is not advisable to bleach any further, as otherwise the luster of the fiber is destroyed.

AMBITIOUS FILM PROGRAM FOR CHEMICAL SHOW; THIRD AND FOURTH FLOOR SPACES AT PREMIUM

Fifteen feature films on chemical and allied scientific or industrial subjects have thus far been definitely scheduled on the motion picture program of the Eighth National Exposition of Chemical Industries. Although the moving picture program has always been one of the chief centers of interest at the Exposition in previous years, the selection for the 1922 program includes some of the best industrial films which have ever been taken, several of which will be shown for the first time to a public audience. Through the co-operation of the United States Bureau of Mines and a number of the exhibitors at this year's Exposition, as well as the Ontario Department of Mines of Canada, many reels of deep interest to chemists and chemical business men have been secured.

For example, "The Story of Sulphur" will be furnished by the United States Bureau of Mines and the Texas Gulf Sulphur Company. "The Story of Abrasives" is to be obtained from the Bureau of Mines and the Carborun-

dum Company, while combined with the Research Corporation, the Bureau will present "Recovering Values from Fume and Smoke." Other mines pictures will include "Inspiration: One of the World's Great Copper Mines," "Mexican Petroleum," and the "Story of Heavy Excavating Machinery." Eight reels will be given exclusively to the manufacture of newsprint at one of the biggest Canadian mills. Dr. David Wesson of the Southern Cotton Oil Company will speak in connection with the motion picture "The Romance of Cotton." The motion picture program will be shown in a special auditorium in the Grand Central Palace, all evening sessions being given over exclusively for this purpose. The full program as arranged to date includes the following:

Program to Date

"Recovering Values from Fume and Smoke," (one reel), courtesy United States Bureau of Mines and the Research Corporation.

"Inspiration: One of the World's Great Copper Mines" (three reels), courtesy U. S. Bureau of Mines.

"The Story of Sulphur" (two reels), courtesy U. S. Bureau of Mines and the Texas Gulf Sulphur Company.

"Mexican Petroleum" (four reels), courtesy U. S. Bureau of Mines.

"The Story of Heavy Excavating Machinery" (four reels), courtesy U. S. Bureau of Mines.

"The Story of Abrasives" (four reels), courtesy of the U. S. Bureau of Mines and the Carborundum Company.

"The Story of Air Reduction," number of reels unknown at this time.

"The Story of Natural Gas," number of reels unknown at this time.

"Fire Fighting with Foamite Firefoam" (two reels), courtesy of Foamite Firefoam Company.

"The Manufacture of Newsprint Paper at the Spanish River Pulp & Paper Company" (eight reels), courtesy of the G. H. Mead Company.

"Nickel and Copper Mining, Smelting and Refining" (three reels), courtesy of the International Nickel Company. Accompanied by explanatory address.

"The Romance of Cotton" (one reel), courtesy of the Southern Cotton Oil Company. Accompanied by an explanatory address by Dr. David Wesson.

"Prospecting for Gold in Northern Ontario" (two reels), courtesy of the Ontario Department of Mines.

"Assaying for Gold in Northern Ontario" (two reels), courtesy of the Ontario Department of Mines.

Space Going Rapidly

If the manner in which American manufacturers have contracted for space at the Exposition is any criterion by which future business may be judged, the chemical, chemical equipment, and allied industries are looking forward to an era of renewed prosperity. All the lower floor positions have long since been sold out, and spaces on the third and fourth floors are at a premium. With over 400 firms already signed up, there is little doubt but that the first four floors of the big Grand Central Palace will be crowded with exhibitors during Chemical Exposition Week.

The program for the afternoon meetings to be held in the auditorium of the Grand Central Palace in conjunction with the Exposition is gradually being whipped into shape. The Technical Photographic and Microscopical Society has announced that a portion of its program which has been definitely completed to date. In addition to other features of the program of interest to the technical photographer and microscopist as an adjunct of chemistry, the following papers have been scheduled:

Photographic Society Papers

"The Photomicroscopy of Paint and Rubber Pigments," by Henry Green of the New Jersey Zinc Company, Palmerton, N. J.

"Photomicrography in Pulp and Paper Research Problems," by Miss Eloise Gerry and Dr. E. M. Diemer of the Forest Products Laboratory, Madison, Wis.

"Handling of Motion Picture Films," by Dominic S. Mungillo of the Craftsmen's Film Laboratory, New York.

"Mechanics of Motion Picture Apparatus," by Clarence W. Gibbs of the Victor Animatograph Company, New York.

"The Motion Picture as an Art in Industry," by Alfred B. Hitchins, director of the Ansco Research Laboratory, Ansco Company, Binghamton, N. Y.

"Microscopy in Leather Tanning," by Guido E. Daub of A. F. Gallun Sons Company, Milwaukee, Wis.

"The Use of the Microscope in Textile Work," by Albert H. Grimshaw, of the Textile School, New Bedford, Mass.

"Protozoa and Rotifera: Studies in Microscopic Animal Life," illustrated by Philip O. Gravelle, South Orange, N. J. This paper will be illustrated with motion pictures.

In addition to the meeting or sessions of the Technical Photographic and Microscopical Society at the Exposition, the organization will have an exhibit at which the advances in technical photography, microscopy, and in chemistry as a result of these two sciences, will be demonstrated. Many of the problems of the chemical consuming industries, particularly regarding the physical nature of raw materials and finished products, have received the attention of a number of members of the society and can be discussed with the investigators at the Exposition.

LOCKWOOD, GREENE IN NEW HOME

Lockwood, Greene & Co., Inc.; Lockwood, Greene & Co., Engineers, and Lockwood, Greene & Co., Managers, have announced the removal of their offices to 24 Federal Street, Boston 9, Mass., on August 1, 1922.

DU PONT ANNOUNCES ANTHRACENE BROWN POWDER

E. I. du Pont de Nemours & Co. announces that it has added to its line of wool colors a fast brown under the name of Du Pont Anthracene Brown Powder. This product is used on yarns, shoddy, raw stock, tops and pieces, in the manufacture of high-grade stiff hats, in the calico and tapestry printing trades, and for obtaining shades of exceptional fastness on silk. In its announcement the company states:

"Du Pont Anthracene Brown Powder is a deep brown of the anthracene series, which is used for dyeing wool on a chrome mordant. It is characterized by very good general fastness properties, good solubility and good level dyeing.

"Du Pont Anthracene Brown Powder is used on yarns, shoddy, raw stock, tops and pieces, either for self-shades or in combination with other suitable colors for producing dark browns, khakis, etc. Its resistance to light, water, washing and alkaline fulling is very good, and because of these properties it is a very desirable color for dyeing goods which are subjected to severe wear.

"This product is used in large quantities by the manufacturers of high-grade stiff hats, the color being applied on a chrome mordant. For such use it is fast to all the processes of manufacture as well as resistant to weather, light, water, etc.

"Du Pont Anthracene Brown Powder should not be applied by the chromate or top-chrome methods, as the dyeings are not fully developed.

"Shades of exceptional fastness are obtained when silk is dyed with this product. In all cases the silk must first be mordanted with chloride of chrome.

"Du Pont Anthracene Brown Powder is used in the calico and tapestry printing trades, and should be applied with acetate of chrome, alumina or iron."

WOULD USE ALLIANCE FUND FOR TEXTILE RESEARCH

In the hearings before the Senate committee investigating dyes, the statement was made that there remains to be invested in education and research several hundred thousand dollars representing the profits of the Textile Alliance, in accordance with the original understanding with the State Department.

"We urge," says the "Journal of Industrial and Engineering Chemistry," "that this fund be devoted to the establishment of an American Textile Research Institute. Notwithstanding the work of government bureaus, private corporations and textile schools, there are concerted efforts abroad which surpass anything we have to offer. As an industry, textile manufacturers have not yet been convinced that they can conduct research as an association enterprise. We believe that unless the present opportunity is utilized it may be many years before adequate work will be supported here.

"A simple effective plan can be devised. Cotton, wool, linen and silk should be represented in the institute. There are strong trade associations representing these fibers. There is a splendid association of finishers, and still other groups of spinners, dyers, dye cleaners, laundrymen, and other crafts directly concerned with textiles. From these groups a strong advisory committee can be formed and by utilizing the income from the fund to be available a deal of important work can be carried on in existing laboratories throughout the country. The initial staff of the institute could consist of a director with proper assistants, and if desirable an early activity could be the establishment of informational service and a statistical bureau and a proper medium for broadcasting new information.

"To divide the capital sum among those now interested in textile research seems to us unwise, for provision should be made for study of new problems as they may arise in whatever laboratory may be best fitted for the investigation. By keeping the present sum as a fund other money is sure to be attracted, and there would be available annually a sum which under wise administration would eventually bring to the laboratories far greater support.

"Plans should be perfected, and it is our hope that the committee appointed by the Textile Alliance to consider and recommend methods for the employment of the money in hand may decide upon some such program as we have here suggested."

NATIONAL ISSUES DYERS' FORMULAS FOR FALL SEASON SHADE CARD

The National Aniline & Chemical Company, Inc., has just issued its customary booklet of Dyers' Formulas for the Fall Season Shade Card, issued by the Textile Color Card Association.

This booklet is very eagerly watched for by the color using trades and is a valuable guide to them in producing the shades authorized by the Textile Color Card Association on various fabrics. It is issued in the spring and fall of each year, following closely upon the issue of the shade cards themselves.

In the particular issue under notice, formulas are given for dyeings on skein silk under each one of the names established by the Textile Color Card Association, and following this a similar treatment is given the formulas for dyeing cotton. This, however, is divided into three methods: First, for light shades secured by direct dyes on cotton; second, medium and dark shades for direct dyes on cotton, and, third, for basic dyes on cotton with tannic acid.

Following this come the acid colors on wool and thereafter the chrome dyes on wool. In each case the method of preparing the dye bath, with the requisite

percentages, is given, so that by following the formulas and the method a dyer may be assured of matching the shades required.

An additional interest is found in this little handbook in that formulas for leather dyeing are given in two methods—one for dyeing 100 pounds of chrome-tanned leather, and the other for dyeing 100 square feet of vegetable-tanned leather.

MR. AND MRS. S. R. DAVID ABROAD

S. R. David, head of the firm which bears his name, accompanied by Mrs. David, sailed on Saturday, July 29, on the "Majestic," for a combined business and pleasure trip throughout the principal European centers.

CHANGES OF ADDRESS, A. A. T. C. C.

The following changes of address of members of the American Association of Textile Chemists and Colorists are herewith noted:

CHANTLER, AMBROSE R.,
102 Congress Avenue, Elmwood Station,
Providence, R. I.

CUSHING, FREDERICK C.,
Care of Atlantic Mills, Inc.
Stottville, N. Y.

DYE CHEMISTS TO HOLD APPLICATION SYMPOSIUM AT A. C. S. FALL MEETING

A recent announcement addressed to members of the A. C. S. Dye Division over the signature of R. Norris Shreve, secretary, says:

"At a number of our meetings we have discussed informally the chemistry of the application of dyes, and we have decided to have a symposium on this subject for the Pittsburgh meeting this coming September. (The Dye Division will probably meet on Wednesday and Thursday, September 6 and 7.)

"We want to get at the fundamentals as to why a dye sticks on a fiber or on a piece of paper or leather. We want facts regarding dyeing and deductions from these facts that will lead us on to better application of dyes.

"This subject is of vital interest to dye chemists, whether their chief work is in the application or the manufacture of dyes.

"Write the secretary at once of any papers you can read or suggestions you have that will make this symposium of value. The program of the meeting also will include any other papers connected with the chemistry of dyes that the members have ready for presentation. The secretary, however, asks for early notice of all papers.

"Do not fail to keep up the good work of explaining to the American people the excellency of American dyes and the importance of keeping this industry here by proper legislation."

TEXTILE ALLIANCE HAS CEASED PLACING ORDERS FOR REPARATION DYES

An announcement of the Textile Alliance, Inc., dated July 31, states:

"After this date the Textile Alliance, Inc., will place no further orders with the Reparation Commission for German Reparation dyes.

"There are now available considerable quantities of such dyes ordered and in transit.

"Attention is called to the fact that no sale or delivery of such dyes can be made without the necessary permit of the United States Treasury Department, Division of Customs, Dye and Chemical Section."

FOAMITE FIREFOAM AND CHILDS UNITE FORCES IN NEW ORGANIZATION TO HANDLE COMPLETE FIRE PROTECTION SERVICE

Announcement has just been made of the consolidation of the Foamite Firefoam Company, with general offices at 151 Fifth Avenue, New York, and O. J. Childs Company, Inc., of Utica, N. Y., in a program uniting these important fire protection interests under a new and complete service organization.

The Foamite Firefoam Company is well known through the work of its fire protection engineers in developing the application of the firefoam method of extinguishing fires to large industrial risks. Particularly in the oil and chemical industries, and wherever special fire hazards have defied the ordinary methods of protection, the Firefoam Company has succeeded in building up a high-class clientele. Most of the readers of this publication are familiar with the advantages of its portable apparatus, system installations, and automatic sprinkler system, the latter being a recent development worked out in conjunction with the Grinnell Company, of Providence.

The O. J. Childs Corporation brings to the new organization a record of successful manufacturing and merchandising which extends back to 1896. "Childs" chemical and motor fire apparatus has the acquaintance and good-will of fire officials throughout the country.

For several years the Childs Corporation has functioned as the manufacturing division of the Firefoam Company, making the Firefoam portable devices at its Utica plant. The present consolidation with the Firefoam sales and engineering organization is expected to give the new and larger company the benefit of many manufacturing and distributing advantages.

At a meeting of stockholders on July 21, it was decided that the company will hereafter be known as "Foamite-Childs Corporation" and the following officers were elected: W. J. Childs, president of the Childs Corporation, was elected president; F. M. Watters, vice-president; E. Janeway, secretary, and F. J. Maginniss, treasurer. James C. Patterson will continue as a director in full charge of sales.

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